FREETOWN
YANGON
HAVANA
YOGYAKARTA
BARRANQUILLA
KAMPALA
SAN JOSÉ
DA NANG
DAR ES SALAAM
NAKHON SAWAN
LIMA
JAIPUR

THE BARTLETT REVIEW 2019

The Bartlett
Faculty of the Built Environment

UCL

Self-build housing programme community dinner in Nakhon Sawan, Thailand. Photographed for KNOW by David Heymann (2019).

WELCOME

We're The Bartlett, UCL's global faculty of the built environment. We're here to build a better future.

Combining architecture and planning with disciplines such as energy and construction, heritage and public policy, we explore human spaces. Not just physical structures like homes, office blocks and cities, but the invisible structures that govern them.

By sharing our research with leading thinkers from industry, government and beyond, achieving true diversity of perspective and expertise, we can understand how these structures affect the way we live. And we can create a vision of a fairer and more prosperous society.

The Bartlett Review, published once a year, is 100–plus pages of groundbreaking thinking and research to have emerged from The Bartlett in 2019 and its impact on the world.

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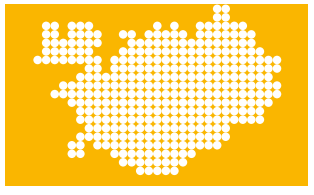
LETTER FROM THE DEAN

SHORT STORIES

LONG STORIES



ANATOMY

2019

ESSAYS X 8

SPECIAL SUPPLEMENT

Enjoy 20 pages of radical thinking from across The Bartlett, inlcuding: Laurie Macfarlane on the role of mission-oriented national investment banks in industrial strategy; Jacqui Glass on transforming the construction sector; Kalliopi Fouseki on how heritage contributes to sustainable development; Yolande Barnes on why the fifth age of cities will be a lot like the first age; Julia Tomei on the lessons that can be learned from Colombia's approach to energy access; Sarah Bell makes the case for applying co-design methods to infrastructure; Andrea Rigon and Alexandre Apsan Frediani on the work of the Sierra Leone Urban Research Centre in transforming informal settlements; and Ilias Krystallis reflects on his time working with the UK government's Grand Challenges team.

CHRISTOPH LINDNER

THE BARTLETT IS HOME TO SOME OF THE MOST TALENTED STAFF, STUDENTS AND ALUMNI IN THE WORLD, TACKLING SOME OF THE MOST URGENT PROBLEMS FACING OUR PLANET. SINCE ITS CREATION A HUNDRED YEARS AGO, THE BARTLETT HAS BEEN A PLACE THAT'S ADDRESSED IMPORTANT DESIGN, SOCIETAL AND SPATIAL ISSUES. BUT THE EXPERTISE WE BRING TOGETHER IN THE FACULTY IS NEEDED NOW MORE THAN EVER.

Our ability to reshape the built environment for a more resilient and just future is going to be essential to how we survive the climate emergency. We live in a world where cities are slowly killing us. In extreme cases, we can't breathe the air, we can't drink the water, we can't walk the streets. Cities and buildings are too often places of unhealthiness – and that needs to be flipped completely. Cities should be places where we thrive. They should enrich our lives and empower us. Rapid environmental change is adding new pressure to the global situation by exacerbating existing threats and creating new ones.

A shared concern that connects all of our Schools and Institutes across The Bartlett is the unequal impact of climate change on cities and communities around the world. Our many areas of expertise give us the ability to do something meaningful about this. For example, we have people working on different aspects of environmental sustainability in the emerging era of climate emergency and injustice, running the gamut from architectural design and city planning, to shaping government policy, to technological innovations in materials and building. Over the next year, we will be doing more to support that work, to give it greater visibility and to map the points of connection around climate-change research and teaching across The Bartlett and UCL.

A strength of our faculty is that the work we do in the studio, in the classroom and in our field research is relevant and applied to the real world. In the area of climate change in particular, we can draw on a robust body of work that is already helping societies to understand the nature and scale of the problems we face and to begin developing solutions.

We are not alone in being concerned about climate change, and it is important that we continue our collaborations with other departments within UCL, with partner institutions, and with partners in government and industry around the world. Our work necessitates such collaboration and it is something to be embraced. In addition, our breadth of expertise gives us the ability to engage with multiple public audiences locally, nationally and globally. These opportunities for knowledge exchange enable us to 'think out loud' about the implications of climate change for the built environment writ large.

One area where this is particularly important is in identifying the inequalities that are embedded in studying the built environment in a time of climate emergency. This means tackling issues of equity and inclusion. It also means increasing diversity within The Bartlett and the built-environment professions.

The Bartlett Promise, which we launched in October 2019, is part of this effort and will offer scholarships worth a total of £1.2 million to students from under-represented backgrounds. It covers fees, living costs and study costs. Recipients also receive mentoring, personal support and careers advice throughout their studies.

In the first year, the scholarship is open to students from the UK and EU applying to our undergraduate degrees in The Bartlett School of Architecture, School of Planning and School of Construction and Project Management. In the future, the Promise scholarship will extend to all parts of The Bartlett and to students at all levels of study, including international applicants.

Increasing our diversity as a community is absolutely critical to our future success. In relation to social justice, it is the right thing to do in a world marked by historic, ingrained imbalances of power that need to be rebalanced. Another reason why it's important is that creativity and innovation flourish under conditions of diversity. By this, I mean diversity in the full, multiple sense of that word – a diversity of languages, histories, identities, cultures, ethnographies, geographies, and more. We are enriched as an academic community by including more people and more perspectives in our conversations. The Bartlett is a place that thrives on difference.

So if we truly want to address something as urgent and daunting as climate change, we need to attract the very best talent from all over the world and at home. The Promise increases our ability to accomplish this.

The Bartlett is world-leading because we think radically and act boldly. As we head into 2020, we recommit to that ethos. We will continue to innovate, take risks and experiment. We will challenge ourselves to push the boundaries of what's possible. ■

SHORT SHORT SHORT SHORT

IN THIS SECTION, WE INTERVIEW NINE BARTLETT ACADEMICS WHO HAVE BEEN FORGING CONNECTIONS BETWEEN THE BUILT ENVIRONMENT AND HOW IT AFFECTS THE WAY WE LIVE IN 2019.

DEREGULATED AND DISREGARDED

Image: Ben Clifford

Dr Ben Clifford's report for the RICS reveals the true face of the offices-to-resi boom: poor-quality housing. ***Words: Katie Puckett***

Studio flats measuring just 12m², "homes" in the middle of industrial estates, children growing up in noisy, overcrowded blocks with no play space: the true face of England's offices-to-resi boom has been revealed for the first time by a Bartlett School of Planning report for the RICS, published in 2018.

Under permitted development rights (PDRs), offices can be converted into homes without planning permission – and therefore with no scrutiny of design, quality or space standards, and without developers making any contributions to local infrastructure or affordable housing. The policy was introduced by the coalition government in 2013 and approximately 60,000 residential units have since been created, says Dr Ben Clifford, Associate Professor in Spatial Planning and Government at The Bartlett, who led the project. "That's a large quantum of places where people are living, and it undermines in multiple ways the creation of sustainable communities. You leave a legacy of poor-quality housing and its effects on people's health and wellbeing."

Clifford and Bartlett colleagues Jessica Ferm, Nicola Livingstone and Patricia Canelas began their research in 2017, when the impact of four years of deregulation was increasingly discussed but little had been published beyond desk-based studies. Over the course of a year, they made 568 site visits across five English cities plus two comparators, surveying projects and their surroundings, counting door buzzers and speaking to residents. They crunched the numbers to assess the financial implications for local authorities, sent questionnaires to occupants and conducted detailed interviews with a range of stakeholders.

Clifford says that they were shocked by what they found: "What stood out for us was the quality of residential development. It was much poorer than we anticipated and affected people much more severely in terms of their quality of life." Some shabby commercial premises had barely been converted at all – one of the many grim photos in the report shows a tiny unit fronting onto a busy main road with personal possessions piled against the windows. Only 30% of conversions met national space standards, and few had access to amenity space. Overall, 77% of the homes were studio or one-bed apartments and many were aimed at the investment market – hardly reflecting or meeting housing need. The five local authorities – Camden, Croydon, Reading, Leeds and Leicester – had lost a potential £10.8m in Section 106 contributions and 1,667 affordable homes, as well as £4.1m in planning fees.

They also produced evidence that deregulation is not the only way to increase housing supply, studying Glasgow, where full planning permission is required, and Rotterdam, where the Dutch government took a more proactive steering role. In both cases, similar numbers of conversions were carried out during the same period, but to a much higher standard. The team concluded that PDRs have been a fiscal giveaway from the state to private real-estate interests, to the detriment of communities, and recommended that the policy be scrapped.

But Clifford is optimistic that the situation may improve. One direct result has been the Healthy Homes campaign by the Town and Country Planning Association, calling for higher standards to apply to all new housing. The Labour party has said it would end PDRs, while the Conservatives have also acknowledged quality concerns.

"I'm told the research has fed into that," says Clifford. "No one is disputing the evidence we found, because it was so detailed, and I think it has helped shift the conversation. Of everything I've done in my career, this is the piece of work of which I'm most proud." ■

Read more: "Assessing the impacts of extending permitted development rights to office-to-residential change of use in England" (B. Clifford, J. Ferm, N. Livingstone, P. Canelas, RICS, May 2018)

PRESENT AND FUTURE ARCHITECTURE

Image: Copyright Philippe Migeat, Centre Pompidou

In recent years, Professor Frédéric Migayrou has initiated *Mutations-Creations*, a programme of five exhibitions devoted to creation and computation at Paris's Centre Pompidou, attracting more than 100,000 visitors for each of the first three sessions.
Words: Debika Ray

As Chair of The Bartlett School of Architecture and Deputy Director of the Centre for Industrial Design at the Centre Pompidou in Paris, Frédéric Migayrou has been instrumental in shaping the discourse around the future of architecture in recent decades and, in doing so, giving form to its present and future.

He began his exploration of architecture's radical edge in 1999, when he co-founded the exhibition series *ArchiLab*, inviting architects from around the world to debate frontline issues in the field. "Computation emerged as the main focus," he says. After his seminal exhibition, *Non-Standard Architectures* (Centre Pompidou, 2003), he co-curated more recently *Naturalizing Architecture* (FRAC Center, 2013) an exhibition devoted to bio-computation and fabrication.He went on to establish B-Pro, or 'Bartlett Prospective' at The Bartlett in 2012, bringing together a suite of Master's programmes with experimental digital designs as their central element.

At the Pompidou, his primary achievement has been the pioneering *Mutations Créations* programme of exhibitions, which have to date explored issues such as 3D printing, coding and synthetic biology. Since then, both 3D printing and coding have become intrinsic parts of architectural education and practice. "In the first exhibition we presented one of the earliest 3D printing machines," he says.

With typical foresight, the next exhibition in 2020, *Neurons, Simulated Intelligences*, will focus on artificial intelligence, tracing its history from the early days of cybernetics to the modern day. "The exhibition is also a critical tool for young architects in the use of building information modelling," he adds. And the 2021 exhibition will be devoted to networks – everything from satellite phones to social networks – considering how permanent connectivity is allowing architects to collaborate globally. "Working with information in real time from all over the world completely changes the economy of architecture and will surely change the works of architects," Migayrou says.

"MORE AND MORE THE VENICE BIENNALE AND OTHER SIMILAR EVENTS HAVE BECOME ART EXHIBITIONS"

His exhibitions invite participation from architects and artists, as well as academics from The Bartlett and other prominent universities around the world. "We are creating a community of artists, architects and designers working with the same processes, procedures, technologies and software, so any person can evaluate their own research in front of others in the field."

In their multidisciplinary approach, Migayrou's exhibitions expand the conversation about building beyond architects, but unlike platforms like the Venice Biennale, the exhibitions retain a keen attachment to practice itself and its possibilities. "More and more the Venice Biennale and other similar events have become art exhibitions – more social studies and critiques about the status of the architect than architecture itself, and its politics, commissions, markets and companies," Migayrou says.

In his work, he has sought not just to critique and challenge, but to transform the work of architects themselves – and intends to continue to do so. ■

Read more: centrepompidou.fr

School of Construction and Project Management

SAFETY UNCONSCIOUS

A study by Professor Hedley Smyth and colleagues finds UK construction firms employing health and safety practices that are sometimes too procedural, prescriptive and inconsistently implemented.
Words: Katie Puckett

After decades of improvement, and with health and safety an avowed priority for contracting firms, safety statistics have plateaued in the UK and in many developed countries.

But perhaps that's the problem, suggests Professor Hedley Smyth at The Bartlett School of Construction and Project Management: firms are too narrowly focused on health and safety itself, and fail to see how it is influenced by wider organisational factors.

Smyth is one of the authors of a piece of research that aims to redress the balance, funded by UCL Grand Challenges and carried out in collaboration with Hong Kong University. "Looking at organisational behaviour enabled us to make connections that previous research hadn't made," he explains. "Health and safety tends to be seen as a discrete, almost isolated, function among main contractors and subcontractors and they've reached the limits of that. They need to break down these organisational barriers to integrate it into everything they do."

For the UK leg of the research, published in March 2019, the team interviewed more than 40 people in the construction supply chain, from senior management and clients to self-employed site operatives.

They found that safety rarely features in corporate strategies, and that systems for managing safety and knowledge are typically separate, missing opportunities for learning. Firms do have strong procedural requirements on health and safety, but it is not integrated into corporate culture and implementation is usually handed down to subcontractors and agency operatives.

"It's very difficult to manage geographically scattered sites on a consistent basis unless you have a strong cultural and behavioural programme in which health and safety is situated," says Smyth. "Most firms don't."

More positively, conditions on site are improving as wellbeing rises up the corporate agenda, for example with the growing provision of healthy food options and rest areas. Management hope such measures could improve wellbeing and reduce near-misses and accidents, though Smyth warns of a perverse effect: "Many people in the construction industry work very long hours and are paid by results. Improving welfare facilities can actually encourage them to work longer, and that can bring in fatigue. That generally applies to office workers, but it's exacerbated in construction because the business model encourages long hours."

To make real improvements, and get off the plateau, contractors could invest in management systems and processes to improve productivity – for example, behavioural programmes or knowledge management systems. "There are lots of low-key incremental investments that have a substantial effect on the way people are managed, the way managers perform and the way that work is conducted."

Smyth has found his ideas gaining traction among both academics and industry. A well-attended workshop drew business leaders and the Health & Safety Executive, and he has been invited to speak at industry events. ■

Read more: "Occupational health, safety and wellbeing in construction: culture, systems and procedures in a changing environment" (H. Smyth, et al. March 2019)

Institute for Innovation and Public Purpose

IT'S NOT ROCKET SCIENCE

The private sector will invest its money where it sees future growth and opportunity. The MOIIS Commission's report recommends how the UK government should direct that investment. ***Words: Brendan Maton***

Establishing missions as a focus for tackling society's wickedest problems and biggest challenges has been popularised by Professor Mariana Mazzucato, Director of the Institute for Innovation and Public Purpose (IIPP). More and more governments have incorporated her thinking into policy.

In the UK, IIPP hosted the UCL Commission for Mission-Oriented Innovation and Industrial Strategy (MOIIS) which sets the agenda for how the Department for Business, Energy and Industrial Strategy (BEIS) should work out which challenges to target and how to tackle them.

In the MOIIS Commission's report last May, four grand challenges were identified: to halve energy use of new and existing buildings by 2030; to use technology to transform the prevention, early diagnosis and treatment of chronic diseases; to enhance capabilities and quality of life across the course of increasingly longer lives; and to put the UK at the forefront of safe, sustainable, universally accessible travel by 2040.

If these sound like bold aims, they are meant to be. Grand challenges should be developed to capture the public's imagination and so inspire politicians to set a course over years and possibly decades, rather than the days and weeks of the news cycle.

For example, the Commission was originally presented with the idea of halving energy use in new buildings. But the preponderance of older housing stock in the UK means that retrofitting is essential if a real difference to climate change is to be made.

Likewise, the use of technology to reduce chronic diseases gets broken down into missions for the IT sector in the NHS. This is not a challenge for medical staff but rather to get the UK's largest employer using data efficiently. Previous attempts to make patient data universally available have failed lamentably.

Such challenges should appeal to any leader's sense of heroism. Amid last summer's 50th anniversary celebrations of the Moon landing – the archetypal "mission" – none other than Boris Johnson claimed that "there are few tasks so complex humanity cannot solve if we have a real sense of mission to pull them off."

Yes, he was talking about Brexit, which is a Grand Challenge of sorts. Concerns remain within IIPP, however, that on the Apollo mission, as on Brexit and so many other big issues, the role of the State in creating economic growth by means of mission-orientated policy gets downplayed. (In his paean to the Apollo astronauts, Johnson neglected to mention the enormous cost of the Apollo programme, US$288bn in today's money, channelled from the State via NASA to innovative private-sector enterprises.

As the MOIIS Commission's report notes, the private sector will invest its money where it sees future growth and opportunity. The government directs such opportunities by a variety of means, including its own purchases. Just as NASA needed to buy loads of new amazing products for the Moon landing, stimulating private enterprise with the security of a guaranteed buyer, so public procurement here in the UK, worth a whopping 13.7% of GDP each year, could be managed more smartly to encourage better IT, housing and transportation services. The first steps on how to do this are in the MOIIS Commission's report. It's bold, but it's not rocket science. ■

Read more: "A Mission-Oriented UK Industrial Strategy" (UCL Commission on Mission-Oriented Innovation and Industrial Strategy (MOIIS), May 2019)

BUILDING KNOWLEDGE

3DStock model. Image: UCL Energy Institute

"BECAUSE OF THEIR INCREASED ENERGY CONSUMPTION, OUR HOPE IS THAT THIS PROJECT WILL HAVE AN IMPACT ON THE TALL BUILDINGS THAT ARE ALLOWED"

Professor Philip Steadman on modelling every domestic and non-domestic building in London and its use of energy for the Greater London Authority (GLA).
Words: Clare Dowdy.

The building stock accounts for 40% of all energy use, says Professor Philip Steadman. So helping them become more energy efficient has a significant environmental impact.

As Emeritus Professor of Urban and Built Form Studies at The Bartlett's Energy Institute, Steadman has been developing the 3DStock modelling method with colleagues for a number of years. His team have recently completed a project for the GLA, which will be used by the GLA and London boroughs to tackle fuel poverty and improve the energy efficiency of the capital's building stock, both domestic and non-domestic. The London Building Stock Model contains detailed data – ages, heights, volumes, wall areas, the distribution of activities between different floors, construction materials and so on – on the great majority of separate dwellings and non-domestic premises in the 33 London boroughs.

The maps in the model also include all the information in Energy Performance Certificates (EPCs) and Display Energy Certificates. There have been maps of buildings' EPCs before. "This time we're linking EPCs with other information on buildings. And as only about half of properties have EPCs, we've created virtual ones," he adds, "statistical estimates based on nearby properties of a similar character."

The model allows users to define an area on a map and ask, for example, for all the information on offices over four storeys with steel construction. There are two versions of the model. One is for the GLA and carries more data and analytical facilities. Meanwhile a public website carrying less information will allow individuals to look at their own properties. "It's a huge job."

The model will also be used for scientific studies of issues including the use of energy by tall buildings. A team at the Energy Institute has shown in previous work that tall buildings are much more energy-intensive than low-rise. Steadman is planning a new project to try to understand why this is. He suggests that stronger winds, lower temperatures, and the fact that tall buildings are less over-shadowed by neighbours, so get more sun, could play a part. "Because of their increased energy consumption, our hope is that this project will have an impact on the tall buildings that are allowed."

In 2020, the team will add the London Solar Opportunity Map, which gives estimates of the potential of all roofs and areas of open land for solar photovoltaic installations. "We're calculating the amount of solar radiation on every surface and the electricity that can be generated via PV panels."

Steadman says one very hopeful development is that the price of renewables is falling dramatically. "They're already competitive with fossil fuels in some parts of the world, and price will change everything." Along with Steadman, those responsible for the London Building Stock Model and the London Solar Opportunity Map are Stephen Evans, Daniel Godoy-Shimizu, Dominic Humphrey, Rob Liddiard, Ivan Korolija and Paul Ruyssevelt. ■

Read more: ucl.ac.uk/bartlett/energy/research-projects/2019/jan/3dstock

Institute for Environmental Design and Engineering

HEALTHY DEVELOPMENT

Skip and waste scavengers, Kisumu. Image: Nici Zimmerman

Nici Zimmerman and a team led by Professor Mike Davies are working with six partner cities to guide development that is not only sustainable but delivers positive urban health outcomes. *Words: Clare Dowdy*

Kisumu, Kenya, faces a complex set of environmental challenges, from poor housing to industrial and household waste management, and the contamination of Lake Victoria, which has led to a reduction in fish stocks and adverse effects on water quality. In addition, slum households do not have access to adequate sanitation and deforestation on the hills above the city has increased flood risks.

Dr Nici Zimmermann, Associate Professor at The Bartlett's Institute for Environmental Design and Engineering, is working with collaborators from the African Population and Health Research Center and Maseno University, as well as a diverse group of stakeholders, including the Kisumu County Government, NGOs, CBOs, residents and industry representatives, to find a cross-sectoral solution to the issue of waste management. It is part of CUSSH, a four-year Wellcome Trust-funded project, which has been set up to deliver key global research on the systems that connect sustainable development and health. Zimmermann and CUSSH are combining these two elements because "often things are looked at isolation, but we think the issues are complex and we embrace that complexity."

According to CUSSH, to date, no city has succeeded in implementing a pathway of development that is consistently and demonstrably on track to deliver long-term environment and health goals that fulfil both local needs and the increasingly urgent imperatives for planetary health. The team is working with six partner cities of varying size, location and income: London (UK), Rennes (France), Beijing and Ningbo (China), Nairobi and Kisumu (Kenya).

"The reason for focusing on cities is because that's where most of the world's population lives, and they're growing, so cities are a leverage point for climate-change improvements," says Zimmermann. As CUSSH publishes its case studies, "we look for local as well as transferable insights to the other cities." The diverse team includes members with health and diverse modelling backgrounds, systems and behavioural scientists. "In general terms, we hope to support the partner cities in developing more ambitious, integrated policies," says Zimmermann.

In Kisumu, the team is helping the planning department to apply to the Green Climate Fund, which aims to assist developing countries in adapting and mitigating practices to counter climate change. Only 25–35% of waste in the city is collected, so CUSSH is focusing on waste management, and is investigating waste-to-energy solutions, such as whether biogas from household and market waste could be used to produce electricity. Zimmermann visited one such trial in Kisumu in July 2019 and says that the next steps in collaboration with Kenyan colleagues from the Kisumu county government, the African Population Health Research Center and Maseno University, are to investigate what might be viable options for upscaling this.

Zimmermann also visited a group of waste scavengers, who search the waste dumped in skips for plastics, which they then sell for recycling. "For two kilos of plastic, they get about 10 pence – about the price of an egg. When I asked what would improve their situation, they said, they want more waste to be brought to the skips," she says.

"Waste management in the city is a very complex issue and the visit made us all aware how careful we need to be about potential unintended consequences in our work." ■

Read more: ucl.ac.uk/complex-urban-systems

Urban Laboratory

WEAPONS OF MASS DISTRACTION

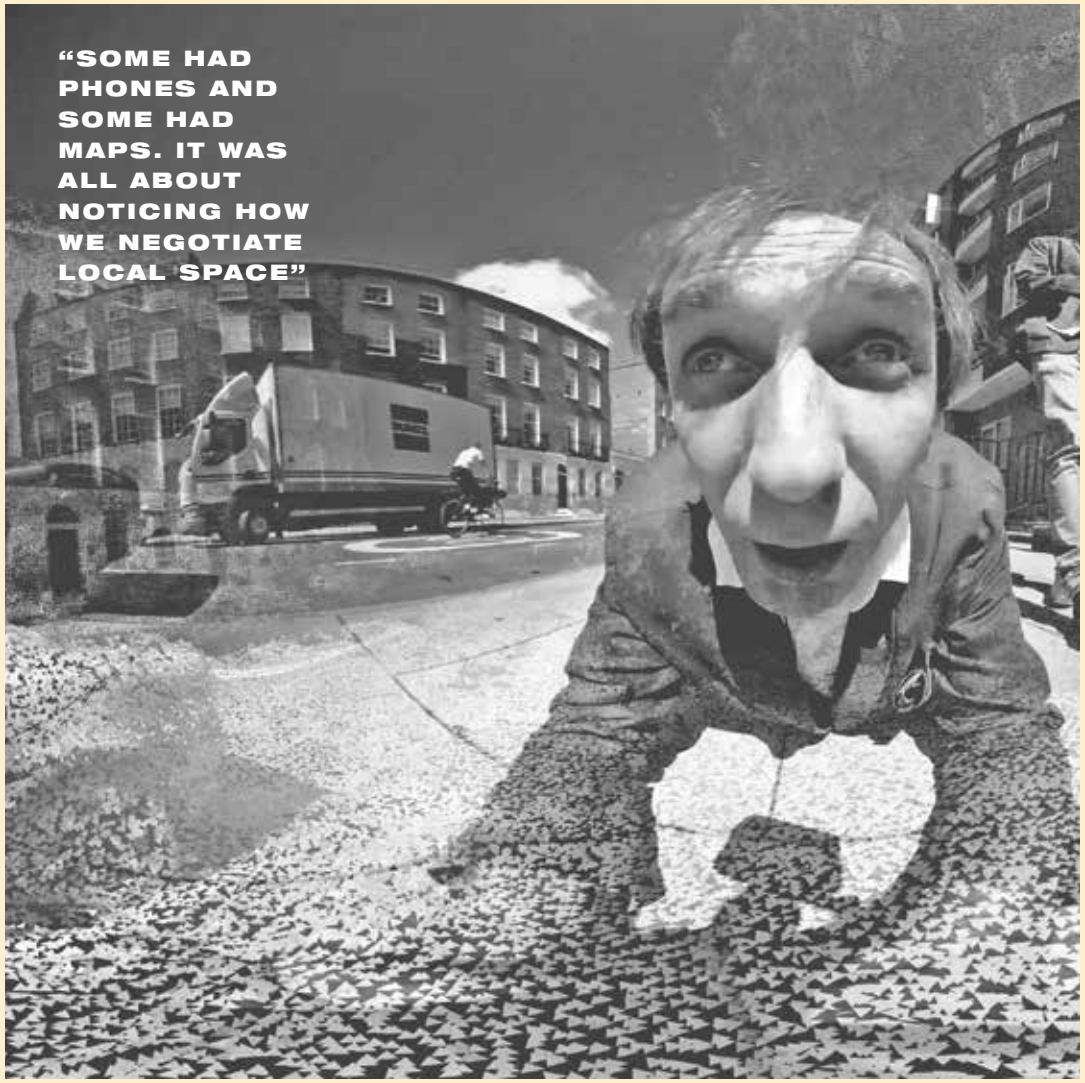
Professor Matthew Beaumont wants to start a social movement to encourage pedestrians to reclaim their attention from their phones as they walk the city streets.
Words: Veronica Simpson

We are in the midst of an epidemic of distracted walking: look around you, in any city, and it is likely that at least half the pedestrians sharing the street with you will be engaging with their phones in some way. This growing phenomenon is of great interest to Professor Matthew Beaumont, Co-Director of UCL's Urban Laboratory, and responsible for its Cities Imaginaries research strand.

In June 2019, Beaumont led students on a tour of the streets around UCL's main campus in Bloomsbury, to encourage some deeper observations of these familiar surroundings. He says: "Some had phones and some had maps. It was all about noticing how we negotiate local space. How you might walk distractedly and how you might walk undistractedly."

Beaumont's writings explore how pedestrian activity highlights shifts in both human and urban conditions. His most recent book, *Nightwalking: A Nocturnal History of London* looked at walking as a subversive or illicit act from the middle ages onwards. He says: "I'm interested in earlier periods of rapid modernisation, particularly in the 19th century. But we're undergoing our own period of rapid modernisation through digitisation."

The urge for that drives pedestrians to switch off from their surroundings via engagement with



Distracted Walking Project. Image: Matthew Beaumont

the multiple seductions of smartphones - whether it's social media, navigational tools or music, which has implications beyond those of mere road safety, says Beaumont. "It is incumbent on us to walk in undistracted ways in our cities, because they are being colonised by private interests and technologies whose role is to police us and construct us as consumers in ways we don't have much control over, and which don't do us any favours."

Just as importantly, he says, is the sensory impoverishment that results from this distraction. "By virtualising our relationship to the city we're cutting ourselves off from its sensuous pleasures. To some extent, we have to cut ourselves off from the streets. If we weren't in a semi-distracted state in the city we'd be overwhelmed. But this has gone too far."

Beaumont hopes to spark nothing less than a social movement. To this end, he showed two films – made with Duncan Hay and Valerio Signorelli at The Bartlett's Centre for Advanced Spatial Analysis – at an Urban Lab event in October 2019. One was an observational tour of Fitzrovia with author and psychogeographer Will Self, and the other of a series of walks conducted by PhD students.

It's just the start. For example, Beaumont plans to set up an online platform where people in cities everywhere can post smartphone snaps of elements of their neighbourhoods which they have spotted only through undistracted walking, encouraging the use of these "weapons of mass distraction" as tools for observation. ■

Institute for Sustainable Resources

WHERE'S THE POLITICAL WILL?

Tackling the world's mounting environmental problems needn't cost the earth, says Professor Paul Ekins. But policy-makers have got to want to do it. *Words: Ian Lewis*

When Professor Paul Ekins, Director of The Bartlett's Institute for Sustainable Resources, was asked to co-chair the latest UN Global Environment Outlook (GEO) report, he asked himself why he, an economist by background, had been chosen to oversee a publication whose 150 or so authors were predominantly natural scientists.

Ekins and his co-chair, Joyeeta Gupta, Professor of Law and Policy in Water Resources and Environment at the University of Amsterdam, concluded that one of their main roles was to ensure that the welter of hard scientific data did not prevent the lives of people affected by environmental deterioration from taking centre stage.

"It was intended, right from the start to make the links between planetary health and human health, and we were very concerned with both the economic and equity dimensions," Ekins says. That focus is clear in the 700-page GEO6 report, published in March 2019, whose subtitle is *Healthy Planet, Healthy People*. It details – and discusses possible remedies for – the gamut of environmental problems from climate change, water scarcity and waning biodiversity to congested and polluted urban spaces, pressure on agricultural resources and contaminated oceans.

One message is that environmental action should be seen not as a cost, but as a means of saving lives – and money – in the long run. The report notes that a quarter of all deaths globally in 2012 could be attributed in some part to environmental factors, including air pollution, unclean water and poor sanitation.

"What is absolutely clear is that, although the environmental situation is dire in many places, there are solutions and we actually do know how to address these issues, if we have the political will to do it. There is no evidence that it would be prohibitively expensive, or that it would have a negative impact on countries' growth prospects," says Ekins.

The need to take a holistic approach on environmental issues is another core theme. So, for example, healthy diets involving less meat, combined with healthy lifestyles, good urban waste management and green infrastructure would lead to increased labour productivity, reduced pressure on agricultural land and cut costs associated with urban congestion and transport-related pollution, the authors say.

To build on the report's outcomes, Ekins has been negotiating a memorandum of understanding between UCL and the United Nations Environmental Programme (UNEP) to investigate why more is not being done to remedy the problems.

"The idea is to set up a process, whereby, starting with the G20 countries, we look at the policy gap between what the scientific evidence demands and what is actually being done in those countries," Ekins says.

He notes that UNEP already looks at how successfully countries are meeting their pledges under the UN-brokered Paris climate change agreement, and says broadening the approach to look at the policy gap relating to other environmental issues should not be a stretch.

"We're currently on a path that is going to make life extremely uncomfortable for many people," Ekins says. "But policy-makers do have the tools at their disposal to make fundamental changes to the way we use the natural environment, which would mean we could still meet our sustainable development goals. We should ensure they use them." ■

Read more: "Healthy Planet, Healthy People" (UNEP 2019)

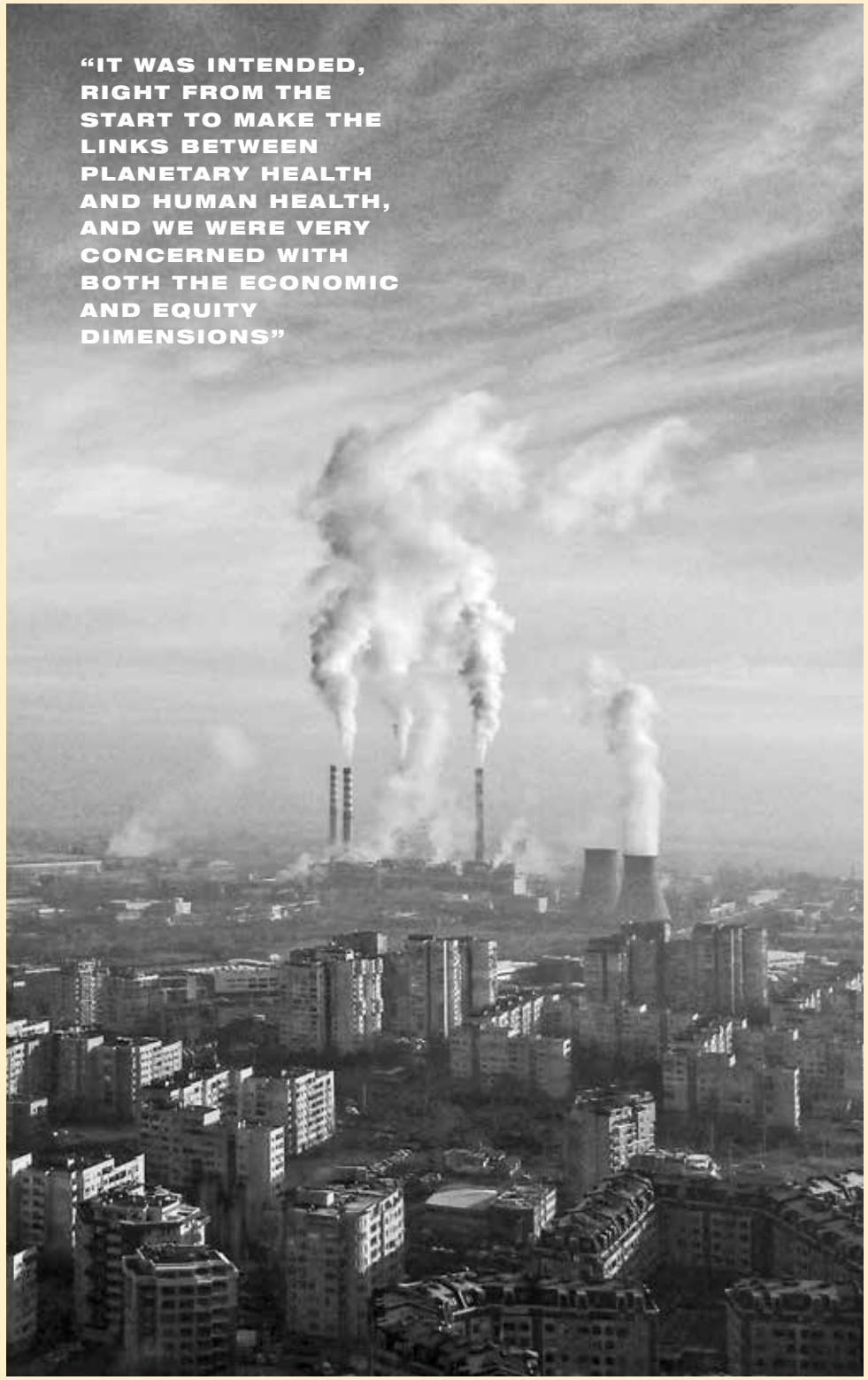


Image: Unsplash

INDIGENOUS INNOVATION

Images: PROCOL Kenya

"THE MAASAI HAVE THE POTENTIAL TO TURN THESE THINGS INTO GLOBAL PRODUCTS IN A SUSTAINABLE WAY"

Can Kenya lead the way to a new kind of prosperity in Africa? And can Maasai warriors teach western tycoons leadership the world needs for the 21st century? Jacqueline McGlade thinks so. *Words: Sophie Arie*

Jacqueline McGlade is Professor of Resilience and Sustainable Development at the Institute for Global Prosperity (IGP) and a former chief scientist at the UN's Environment Programme. Until 2013, she was Executive Director of the European Environment Agency and in the past she has advised both Russia and the US on their space programmes.

Today, however, she lives with a Maasai tribe in a mud hut in Kenya where she is the lead scientist for PROCOL Kenya, a new programme launched by the IGP in November 2018 to develop innovative pathways to prosperity, autonomy and resilience in Africa.

PROCOL Kenya works on the premise that economic growth has failed to produce prosperity and a good quality of life for most of the world's population, and that 'honest independent science brokers' from the IGP and its partner institutions, can help Kenya come up with alternatives.

"PROCOL Kenya is about creating an umbrella under which trust can be built to solve different issues using the best scientific and research knowledge that we have," McGlade explains on a flying visit through London.

The research is based on empowering the community to become researchers themselves and acquire the knowledge they need to make decisions that will promote their 'natural prosperity'. "The Maasai have extraordinary medicinal plants," says McGlade. "They have an insulin plant, antimicrobials that will knock the socks off anything you can get from the pharmacy, anti-malarial, anti-cancer treatments. They have the potential to turn these things into global products in a sustainable way" she says.

By mapping their forests, the community McGlade works with has logged the risks those plants face, developed ways to protect them and grown and planted seedlings to have trees with commercial value, while also mitigating climate change.

At the same time, PROCOL Kenya is encouraging data literacy among civil servants so they can create data and management systems for agriculture, infrastructure, land management and tax collection. And at the highest level, McGlade is working with the vice-president on tackling corruption and developing the Kenyan Space Agency.

"If you don't work on all these levels, nothing works," she says. But what makes PROCOL Kenya really different is that it is about "using indigenous knowledge to shape innovations of the 21st century, not the other way round".

McGlade has brought global business leaders for 'initiation' in Maasai tribal ways, spending days on so-called 'meat camp' in the bush, joining the tribal chiefs for their ritual cattle slaughter. She says: "The Maasai have lasted for so long because their system makes them so resilient."

While global business leaders are almost totally disconnected from their workers, the Maasai community is properly engaged through the way in which elders meet and consensus is built. "Companies want to understand the nomadic style of leadership and how it can be effective for them," she says. ■

Read more: procolkenya.com

AT THE BARTLETT, WE DON'T WANT OUR RESEARCH TO SIMPLY BE READ BY OTHER ACADEMICS IN ACADEMIC JOURNALS. SO, IN EACH ISSUE, WE COMMISSION SIX WRITERS TO TAKE AN IN-DEPTH LOOK AT HOW SIX RESEARCH COLLABORATIONS ARE HAVING REAL-WORLD IMPACT.

KNOW IS ONE OF THE BIGGEST RESEARCH GRANTS THE BARTLETT HAS EVER RECEIVED AND ITS AMBITION – TO HELP **12 CITIES** IN THE GLOBAL SOUTH UNDERSTAND HOW TO CREATE **URBAN EQUALITY** AS THEY GROW – IS EVEN BIGGER. THE **POOREST CITIZENS** MUST BE **INVOLVED** IN SHAPING THEIR CITIES.

WORDS: SOPHIE ARIE →

In Kampala, Uganda, some of the city's poorest residents have found a way to make household fuel by collecting organic waste – mainly agricultural and food processing waste – drying it in the sun, burning it in a kiln and mixing the ash with fine clay to make briquettes, creating a livelihood for themselves and positively affecting solid waste management in the city, which has been largely overlooked by residents and authorities. That is starting to change.

In Dar es Salaam, Tanzania, in an informal settlement in the south-west of the city, residents of a neighbourhood have been working with a local NGO to build a simplified sewerage system, an innovative approach to the provision of toilets, creating better living conditions for each household and demonstrating a new approach to the provision of sewerage infrastructure in the city, which has not been considered at scale by the local authorities. That is starting to change.

In Nakhon Sawan, Thailand, low-income residents have benefitted from 15 years of city-wide community organisation, collaboration with the local government and engagement with the national Baan Mankong Housing programme. Working in alliance with an NGO to reflect on their own experience of accessing improved housing, they are doing research together to provide concrete knowledge to strengthen and upscale support to the provision of housing in the province and the country. This will feed into ongoing change.

These examples are some of the initiatives to emerge from a global project launched by The Bartlett's Development Planning Unit (DPU) in 2017 called Knowledge in Action for Urban Equality (KNOW).

"There will be a city-wide impact in these different places," says Emmanuel Osuteye, a DPU Research Fellow working with KNOW partners on a range of research and capacity building initiatives, each aimed to have a positive effect on relations between those living in informal settlements, the city council and other actors in the city.

With a budget of more than £7m from the Global Challenge Research Fund (GCRF), one of the largest grants The Bartlett has ever received, KNOW is a four year project (2017 – 2021) that aims to produce transformational research and grounded capacities for innovative planning and policy to promote urban equality as cities face new and ongoing challenges.

RETHINKING PLANNING

Two out of three people are expected to be living in urban areas by 2050 but as cities have grown, urban inequality has increased. UN Habitat estimates that over one billion people – one in eight of the global population – currently live in slum conditions. Across much of the world, city officials often see informal settlements and slums as illegal and do little to improve them or support their residents. "The challenge is to rethink planning in a way that recognises informality in cities and the positive contribution that women and men living and working in informality make to the just development of a city, now and in the future" says the DPU's Professor Caren Levy, who leads KNOW. "In many places, where informality is equated with illegality, this creates huge barriers and problems for urban residents – and the development of more equal cities," she says. "KNOW is about co-creating opportunities for change."

TWO OUT OF THREE PEOPLE ARE EXPECTED TO BE LIVING IN URBAN AREAS BY 2050 BUT AS CITIES HAVE GROWN, URBAN INEQUALITY HAS INCREASED.

Women's community group briquette making, Kasuubi Zone III, Kampala. Image: David Heymann (2018)

75%
OF THE WORLD'S CITIES HAVE HIGHER LEVELS OF INCOME INEQUALITIES THAN TWO DECADES AGO.

Working in 12 cities across the Global South (Barranquilla, Havana, Lima and San José in Latin America; Da Nang, Jaipur, Nakhon Sawan, Yangon and Yogyakarta in Asia; and Dar es Salaam, Kampala and Freetown in Africa) and combining six different work streams, KNOW seeks to find innovative and more effective ways of delivering prosperity, tackling extreme poverty and building urban resilience.

This ambitious project builds on the connections and partnerships the DPU has developed globally over many years and is based on a principle of much of the DPU's work – that the poorest citizens are meaningfully involved in shaping their cities. A key part of KNOW's work involves enabling communities to fill the vast gaps in knowledge that mean city authorities often have little accurate data and information about how women and men, girls and boys living in informal settlements experience the city and how they contribute to its development. KNOW aims to identify ways for that knowledge to be co-produced, shared and turned into action and used to inform policy and practice, as well as the education of future planners and urban practitioners (see p.33).

In Sierra Leone's capital Freetown, for example, KNOW is working with the Sierra Leone Urban Research Centre (SLURC). SLURC was established in 2015 out of a partnership between DPU and the Institute of Geography and Development Studies at Njala University, to support residents of informal settlements to gather all kinds of knowledge about how the poorest residents of the city live and their capacity to improve their own lives.

They are mapping the city's informal settlements, logging details on everything from numbers of residents to the locations of the few water

KNOW AIMS TO PRODUCE TRANSFORMATIONAL RESEARCH AND BUILD CAPACITY FOR INNOVATIVE PLANNING AND POLICY TO PROMOTE URBAN EQUALITY AS CITIES GROW.

taps residents depend on and who controls them. At the same time, they are recording examples of how residents can improve their own living conditions, given some technical training and support. This process of documentation aims to demonstrate the urgent need to improve living conditions in Freetown's informal settlements, while at the same time recognising the opportunities to do so through a community-led approach, and in partnership with government and civil society actors.

KNOW is building on previous DPU work with SLURC, such as the community-led mapping methodology, ReMapRisk, developed under the auspices of an earlier project, Urban ARK (DFID-ESRC, 2015-2018), in which strategic action plans were developed with communities in Freetown. This included the informal settlement of Dwarzack, where deep and wide drainage gullies running down the hillside make it hard for people to move from one part of the settlement to another and were a hazard in the rainy season for children who needed to cross them to get to school. The residents clubbed their limited resources together and, with technical advice from SLURC, built a bridge.

"They didn't just build it randomly," explains Alexandre Apsan Frediani, Associate Professor at the DPU and a co-founder of SLURC. "They did it as a result of a collective process of discussion, deciding what their priorities were, identifying the best place for it."

This small strategic intervention is a classic example of the potential to build the capacity of some of the poorest urban communities to set precedents on how community-led processes can bring about meaningful change. "It demonstrates how knowledge translates into action," says Osuteye. "And it highlights how people are not helpless. Under the right conditions, they can be active participants in development." KNOW will build on this kind of experience in order to scale up community-led planning at city-wide level.

Community bridge project, Dwarzarck, Sierra Leone.
Image: Camila Cociña (2018)

46%
ARE IN VULNERABLE EMPLOYMENT ACCOUNTING FOR 1.5 BILLION PEOPLE GLOBALLY.

WORKING WITH REALITY

One of the unusual things about the KNOW project is that capacity building is considered as valuable as research. KNOW has begun to publish research and, in 2020, will produce analysis on the potential impact of initiatives like the Kampala briquette-makers' business. At the same time, the process of capacity building accompanies the research, enabling people to 'co-produce' and exchange knowledge and translate it into collective action.

As Levy explains, a huge part of the work of the KNOW project, especially in its initial phase, has been to develop human connections and build and change relationships across traditional divides. Many city authorities in developing countries are still working to outdated or colonial-era building standards and planning ideas that do not recognise current realities and focus on trying to evict slum dwellers.

"There is always someone in city planning offices who is open to new ways of thinking and wants to change the way things work from within," says Levy. "It's about building coalitions with like-minded people in organisations across the city."

KNOW focuses on co-producing knowledge, sharing, comparing and turning it into action, as well as the ethics of research practice, education of urban practitioners, and the use of UK official development assistance in urban development. A significant part of KNOW is about fostering exchange between people who might otherwise not get the opportunity to do so. For example, academics from Sierra Leone have met their peers in Havana. Across the six work streams and within the 12 KNOW cities, citizens are meeting city officials and politicians, businesses and academics. KNOW also seeks to set up 'urban learning hubs' to support the implementation, monitoring and learning from progress towards national and global UN Sustainable Development Goals and the New Urban Agenda, both of which see urban equality as a priority.

At the same time, information is being shared in multiple formats and languages from simple leaflets to videos to databases and research papers to 'scale out' the knowledge gained through KNOW to organisations and individuals not yet involved. "Communication is absolutely central, at every level of this project," Levy says.

COMMON CHALLENGES

The 12 cities in which KNOW is working span three continents and each has their own individual identities and challenges. Havana, Levy explains, is one of "the most equal cities in the world" in terms of housing, food and healthcare being provided to all. But the challenge, as Cuba's economy opens up, is to generate prosperity without increasing inequality. Freetown has extreme poverty and weak public bodies due to a long and horrific civil war and, more recently, the devastating Ebola crisis. But it now has a visionary mayor, whose 'Transform Freetown' vision for the city offers hope and opportunity. Yogyakarta in Indonesia is a medium-sized city that is growing fast, where tourism is driving the economy, and causing the threat of evictions. But community mobilisation and decentralisation may provide an opportunity for new initiatives with city authorities.

KNOW recognises that many cities worldwide also face common challenges – rapid growth, climate change and pollution to name a few – and lessons learnt in one city may provide information and

knowledge that others can use. One of the over-arching principles of the project is to shake up traditional concepts of international engagement, research and capacity building, by promoting 'partnerships with equivalence' where there is genuine 'co-production' of knowledge. This is based on mutual learning, rather than the extraction of information by researchers from the subjects they study.

These are approaches that the DPU has long championed and KNOW is working to continue to advance this agenda. "What is different about KNOW is its focus on the quality of the processes engendered and their outcomes across multiple scales. KNOW is as much about globalising local action towards urban justice, as localising global commitments towards the same end," says the DPU's Professor Adriana Allen, who leads KNOW's work on learning and planning education in collaboration with the Indian Institute of Human Settlements (IIHS).

"KNOW is a large platform where connections across different city trajectories and pathways towards urban equality can be found. The project has all the right ingredients to co-produce valuable insights about the changes required and opportunities available to pave the way towards urban justice across the global South." ■

63%
OF AFRICA'S LABOUR FORCE IS TRAPPED IN VULNERABLE EMPLOYMENT.

Precarious settlement (*poblados*) in Lima, Peru. Image: KNOW (2017)

READ THE RESEARCH

- KNOW: urban-know.com
- "Knowledge co-production for urban equality" (KNOW Working Paper no. 1, May, 2019)
- "Translating knowledge for urban equality: alternative geographies for encounters between planning research and practice" (KNOW Working Paper no. 2, May, 2019)

LEARNING AND PLANNING EDUCATION TOWARDS URBAN EQUALITY

One stream of KNOW focuses on planning education and how urban practitioners – professional planners, grassroots actors, and governments and many more – learn the skills, knowledge and values required to work towards urban equality.

As explained by the DPU's Professor Adriana Allen: "planning education and professional praxis can work either to reproduce or challenge urban equality. Key obstacles in this field include the unequal distribution of planners across the global South; the lasting legacy of colonial planning curricula; and inadequate pedagogies and tools for addressing contemporary challenges. Our work within KNOW aims to explore pathways to overcome these prevailing challenges to contribute towards the re-invention of planning education."

In Latin America, Adriana Allen and Julia Wesely are collaborating with the Habitat International Coalition (HIC-AL), an umbrella organisation for civil society groups advocating the right to the city. Over decades, HIC-AL member organisations have developed pedagogic approaches to build schools of grassroots-led urbanism. KNOW is documenting these processes and helping to systematise these pedagogies and understand how they travel across different contexts, while fostering alliances with academic and governmental institutions to transform planning education.

In Freetown, the team is working with SLURC as well as one of the DPU MSc programmes in Environment and Sustainable Development. In April, they held long conversations with young urban practitioners from Sierra Leone engaged in this ongoing alliance. These talks helped to better understand their learning trajectories in and outside classroom-based education, as well as their capacities and challenges to be active contributors towards urban equality.

These learning trajectories are simultaneously a tool for learners to become more aware of the knowledge they have, and for planning education institutions to update and reframe their curricula and pedagogy. For example, many of the learners interviewed acknowledge that their lived experience made them 'bilingual' across a diversity of urban dwellers, allowing them to engage fluently with established inhabitants and migrants or landlords and tenants, amongst others. These insights are feeding into the design of a new Masters programme led by SLURC at Njala University.

Ethics co-production workshop participants, Dar es Salaam. Image: David Heymann (2019)

PLASTIC PLANET

PLASTIC WASTE IS NOW SO PERVASIVE THAT THERE'LL NEVER BE ONLY ONE SOLUTION TO THE PROBLEM, WHICH IS WHY A MULTIDISCIPLINARY TEAM FROM ACROSS THE BARTLETT AND UCL ARE TRYING TO TACKLE IT FROM EVERY ANGLE.

WORDS: DEBIKA RAY

→

"Our main aim is to it communicate the complexity of the issue," says Teresa Domenech, Lecturer in Industrial Ecology and the Circular Economy at The Bartlett's Institute for Sustainable Resources (ISR). "Single-use plastics have captured the attention of the media, but the packaging is only a small percentage of the plastics we use – they are used in construction, electronics, agriculture, and almost every other sector."

"SINGLE-USE PLASTICS HAVE CAPTURED THE ATTENTION OF THE MEDIA, BUT PACKAGING IS ONLY A SMALL PERCENTAGE OF THE PLASTICS WE USE – THEY ARE USED IN CONSTRUCTION, ELECTRONICS, AGRICULTURE, AND ALMOST EVERY OTHER SECTOR"

Domenech is working as part of a team at UCL on an 18-month project housed at the university's Institute of Making that aims to bring a holistic, multidisciplinary approach to this pressing issue. Funded by the UK Research and Innovation, it brings together researchers from a range of fields – from chemistry and engineering to behavioural sciences – in an effort to design out plastic waste from our systems of production, using a combination of science, infrastructure and policy.

"We would like to provide clarity so we can judge what kind of policy interventions, consumer-led actions or infrastructure could make the biggest impact in creating a more circular economy – because we are very far from that at the moment," Domenech says.

Mark Miodownik, Professor of Materials and Society in the UCL Mechanical Engineering Department, is leading the project. "There is no one solution to the plastic waste problem, so we came to the realisation that you need a multidisciplinary approach to have any chance of tackling it," he says. The strategy is, therefore, threefold: apply biological principles to improve the biodegradability of difficult-to-recycle plastics; put in place ways to ensure more plastic is recycled or reused; and improve our public, commercial and industrial habits when it comes to waste generation and reduction.

Illustrations: Ruby Wright, artist in residence at the Plastic Waste Innovation Hub

CRACKING THE CHEMICAL EQUATION

On the first of these research fields, work is underway on considering what enzymes and bacteria might help with plastic biodegradability, as well as on assessing the impact of plastics on the natural environment over its lifecycle. "The assessment will provide estimates in terms of CO2-equivalent emissions, energy consumption, and effects on humans and the biosphere," says Paola Lettieri, Professor of Chemical Engineering at UCL's Faculty of Engineering Science.

Miodownik says there is a lack of technological solutions to deal with the plastics we currently use, but points out that the solution is not as simple as just creating bioplastics – something that has become an increasing focus in the design world. "What we are currently doing is asking the question, are biodegradable plastics the answer or the problem? The conclusion so far is that it's well meaning, but not very helpful."

The barrier is not so much that these plastics do not biodegrade but that the system doesn't exist for that to happen. "Biodegradable plastic, if it's put into the recycling, contaminates plastic for recycling," he says. "If it's put in the bin, it goes to landfill or gets burned. And these bioplastics don't tend to biodegrade in any short time period, even if you put them in your compost." So, what is the solution? "The first thing we would say is stop promoting biodegradable plastics until we understand them better," says Miodownik. "A more environmental solution is to reduce the use of plastics or to use recyclable plastics."

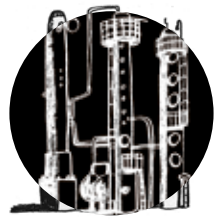
Biowaste plastics also consume land and water and, perhaps a bigger issue with plastics in general, is that the energy that goes into making plastics are not renewable, which contributes to our overall carbon footprint. "The feedstock for the plastics needs to come from bio-based renewable resources," Miodownik says. Lettieri's work will look into the gains of decoupling plastics from fossil feedstocks, evaluating the energy consumption of the process chains involved in the manufacturing of new biopolymers developed within the project.

5M
TONNES

THE AMOUNT OF PLASTIC WASTE GENERATED ANNUALLY IN THE UK IS ESTIMATED TO BE NEARLY 5 MILLION TONNES. (ONE TONNE OF PLASTICS IS EQUIVALENT TO 20,000 TWO-LITRE DRINKS BOTTLES OR 120,000 CARRIER BAGS).

Source: WRAP, LINPAC

BIOMASS



CHEMICAL ENGINEERING

POLYMERS

PLASTIC

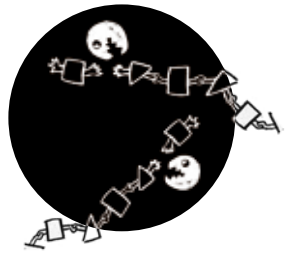
TURNING THE SYSTEM CIRCULAR

Even when it comes to recyclable plastics, the problem is systemic rather than simply an issue with the material itself. Domenech's work centres very much on this aspect of the problem. She is conducting a material flow analysis to work out how much plastic we consume, at what stage plastics become redundant and enter the waste cycle, where they end up, where the leakages in the system are and whether or not there is adequate infrastructure in place to deal with these materials. "We are trying to have a picture of the whole system to understand how we intervene to make it circular," she says.

A similar Europe-wide study that Domenech worked on found that only 6% of plastics currently re-enter the system, despite 40% of them being recycled. She estimates that the findings in the UK will be similar, but that her analysis will allow for a more detailed picture and therefore targeted solutions. "I think it's about placing more responsibility on the manufacturers and producers of plastics, so they are aware they're going to be financially responsible for the end of life of those products," she says. "That might promote better design of products that can be more easily recycled."

A SUATAINABLE SYSTEM FOR BIO-PLASTICS

Biodegradable plastics are growing in popularity both with brands and the public. However, there is no UK–wide system for the collection and processing of biodegradable plastics. If they are put into recycling they contaminate it. If put in the food waste collection they are mostly rejected because anaerobic digestors are not optimised for them and their calorific content is too low. Instead they are put in landfill where they will be for decades. The flow chart on these pages shows what a more sustainable system looks like.



RECYCLING

Illustrations: Ruby Wright, artist in residence at the Plastic Waste Innovation Hub

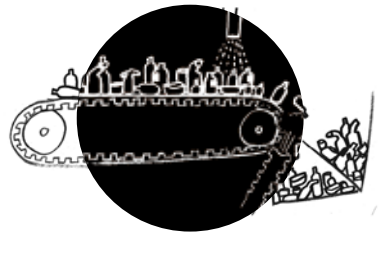
BREAKING BAD BEHAVIOUR

The final aspect of this project in behavioural change – how the problem of plastic is communicated to the public and how people can be encouraged to develop better habits when it comes to recycling. Domenech explains: "How do we create more clearly identifiable labels so that citizens can understand the different types of plastics? What can they do at home to increase recycling?"

Susan Michie, Professor of Health Psychology and Director of the Centre for Behaviour Change at UCL, says her strand of the project will assess motivation, capability and opportunity when it comes to interventions to tackle the problem of plastic waste. "We are considering using UCL as an experimental laboratory to reduce single-use plastic brought onto campus – water bottles, coffee cups, industrial packaging, for example – and to ensure that waste is appropriately recycled, targeting both producers and consumers of plastic on campus," she says.

UCL East – the university's new campus in Stratford, East London – provides opportunities to conduct these experiments. However, Miodownik points to the difficulties in making these changes in a context that is set up to rely on disposables – for example, the lack of washing-up facilities for reusable cutlery and crockery. Where there are financial incentives to bring your own cups to a cafe, he observes, most people still prefer the convenience of disposables. "How would we shift people sufficiently?" he asks. "We are hoping to trial a reusable cup system where reusable cups are available at the point of sale then a third party collects them, cleans them and returns."

CRISP PACKET



SORTING

COLLECTION

This is because behavioural change, he says, is promoted when you make things really simple for people to do. "You shouldn't ever have to look at what you are recycling," Miodownik says. "All packaging should be recyclable and all of it should go into your recycling bin. It's a question of weaning companies off the non-recyclable packaging and getting local authorities to invest in recycling facilities." One positive development he points to is a government consultation on putting in place rules to ensure that if a business creates packaging, it also has to put money into collection and repurposing.

Part of the project at UCL involves working with the waste collection industry, retailers, brands, policy-makers, local government and charities, to help them design out plastic waste. Several of these sit on the project's advisory board as part of a steering committee, which will ensure the legacy of the project after the 18-month funding comes to an end.

Ultimately, Miodownik says, it's important not to demonise plastic, which fulfils an important function when it comes to food preservation and preventing waste. But the most crucial message he feels should be conveyed is that there's only so much we can do to solve the problem without hugely reducing the scale of our current plastic consumption. Which means there has to be a concerted drive to eliminate plastic. "Our interim conclusions in the face of this difficult environmental situation is to reduce at all costs, not to replace," he says.

Domench agrees: "Even if recycling rates improve, the level of circularity of the system will still be relatively limited, so we have to also look at what we can do to reduce overall demand for plastic or try to find solutions that promote more reuse of materials or other options," she says. "In 18 months, we will only be able to scratch the surface of the problem." ■

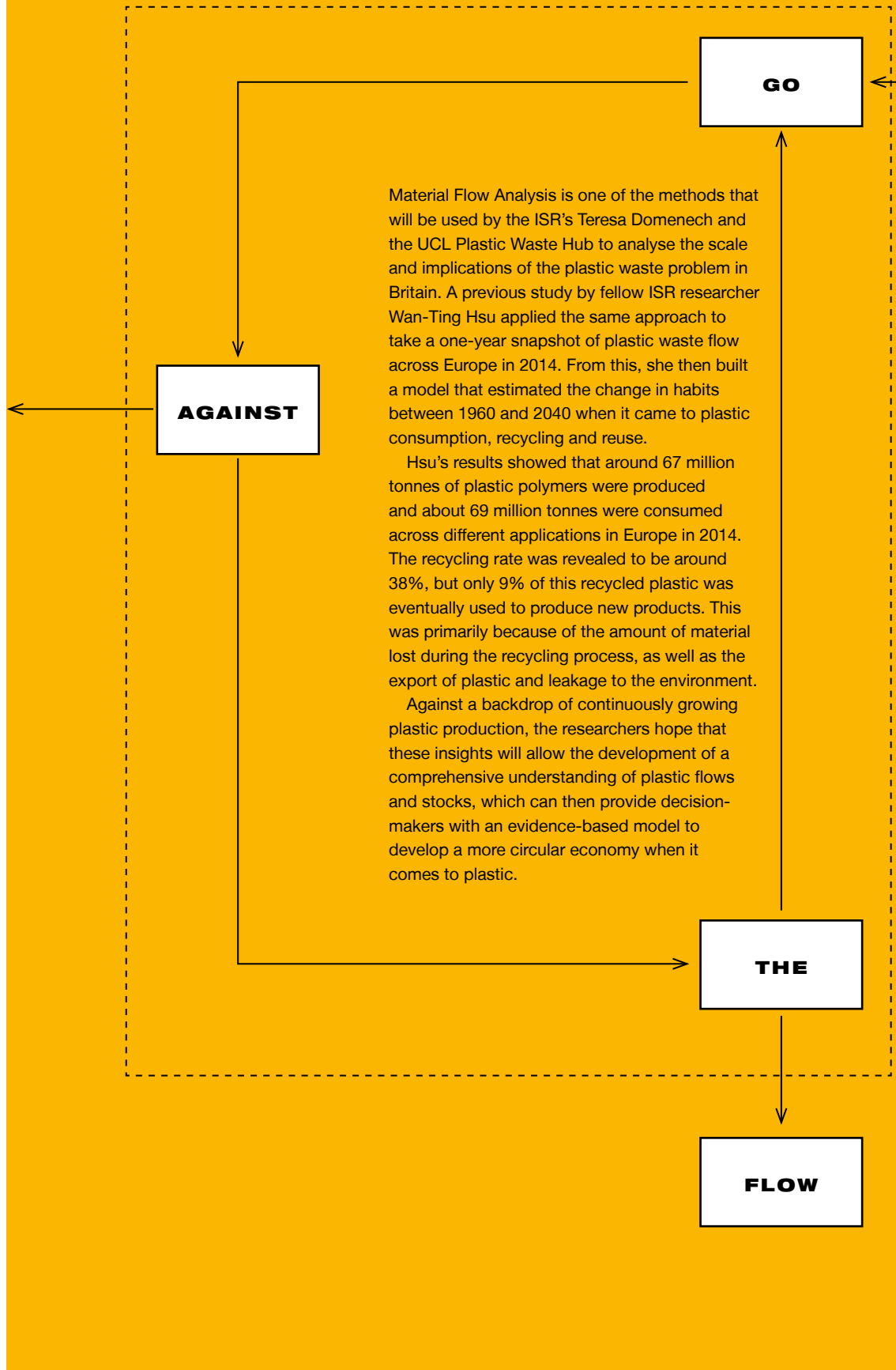
READ THE RESEARCH

- Plastic Waste Innovation Hub: plasticwastehub.org.uk
- Big Compost Experiment: bigcompostexperiment.org.uk
- "Circular economy of plastics: analysis of plastic flows and stocks in Europe" (W. Hsu, T. Domenech, W. McDowall, PLATE: Product Lifetimes And The Environment, 2019)
- "Plastic Food Packaging Waste" (POST Briefing Note: No. 605, July 2019)
- "Compostable Food Packaging" (POST Briefing Note: No. 606, July 2019)
- "Opportunities for chemical recycling to benefit from waste policy changes in the United Kingdom" (C. Partridge & F. Medda, *Resources, Conservation & Recycling*, 2019)
- "The behaviour change wheel: A new method for characterising and designing behaviour change interventions" (S. Michie, M. M van Stralen & R. West, *Implementation Science*, Vol. 6, 4, 2019)

100M
TONNES

THE WORLD'S ANNUAL CONSUMPTION OF PLASTIC MATERIALS HAS INCREASED FROM AROUND 5 MILLION TONNES IN THE 1950S TO NEARLY 100 MILLION TONNES TODAY.

Source: WRAP, LINPAC



Material Flow Analysis is one of the methods that will be used by the ISR's Teresa Domenech and the UCL Plastic Waste Hub to analyse the scale and implications of the plastic waste problem in Britain. A previous study by fellow ISR researcher Wan-Ting Hsu applied the same approach to take a one-year snapshot of plastic waste flow across Europe in 2014. From this, she then built a model that estimated the change in habits between 1960 and 2040 when it came to plastic consumption, recycling and reuse.

Hsu's results showed that around 67 million tonnes of plastic polymers were produced and about 69 million tonnes were consumed across different applications in Europe in 2014. The recycling rate was revealed to be around 38%, but only 9% of this recycled plastic was eventually used to produce new products. This was primarily because of the amount of material lost during the recycling process, as well as the export of plastic and leakage to the environment.

Against a backdrop of continuously growing plastic production, the researchers hope that these insights will allow the development of a comprehensive understanding of plastic flows and stocks, which can then provide decision-makers with an evidence-based model to develop a more circular economy when it comes to plastic.

DESIGNING OUT DISEASE

INSECT-BORNE DISEASES LIKE MALARIA, DENGUE AND ZIKA ACCOUNT FOR MORE THAN 17% OF ALL INFECTIOUS DISEASES WORLDWIDE. WHAT IF WE COULD PREVENT THIS BY CHANGING THE WAY WE BUILD?

WORDS: HUGO COX

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A purpose-built house in rural Malawi is soon to host one of the year's more unlikely natural history documentaries. Two unfortunate volunteers will pose as bait while, every night for 30 nights, researchers with infra-red cameras will film attempts by 500 Anopheles mosquitoes, Africa's most potent malaria carriers (for this experiment, specially bred to ensure they do not carry the disease), to enter the house for a meal. The experiment will investigate how effective variations in the house's design – researchers can open, close or screen the eaves and windows – are in keeping out the mosquitos.

Welcome to the brave new world of the BOVA (building-out-vector-borne-diseases) Network. Led by Durham University with The Bartlett's Institute for Environmental Design and Engineering (IEDE) as a key partner, BOVA has commissioned the Malawi study, along with seven other experiments currently in the field across Africa, as part of a radical interdisciplinary approach to preventing insect- or vector-borne diseases such as Malaria, Dengue and Zika disease by improving the built environment.

These account for more than 17% of all infectious diseases worldwide, causing more than 700,000 deaths annually according to the WHO. Malaria causes more than 400,000 deaths every year globally, most of them children under five years of age. More than 3.9 billion people in over 128 countries are at risk of contracting Dengue, with 96 million cases estimated per year. Other diseases such as Chagas disease, leishmaniasis and schistosomiasis affect hundreds of millions of people worldwide.

Historically, much research about the spread of these diseases focussed on water and sanitation, neglecting the built structures in which transmission takes place and therefore missing a vital trick. Changes to the built environment – screening doors and windows, or preventing accumulation of standing water around the home, for example – can have a huge impact on preventing disease.

"SCREENING DOORS AND WINDOWS CAN HAVE A HUGE IMPACT ON PREVENTING DISEASE"

Part of the reason for the neglect boils down to obstacles associated with combining the insights from diverse professions and academic disciplines. "Vector-borne disease experts and epidemiologists remain largely divorced from architects, engineers and urban planners," says Michael Davies, Professor of Building Physics and the Environment at IEDE, who co-leads the BOVA Network alongside Principal Investigator Professor Steve Lindsay at Durham University.

Generally, such disciplinary obstacles have held policy initiatives around the built environment hostage to a multiplicity of unintended negative consequences. Increasing the air-tightness of building – as sustainability experts are wont to do to reduce the energy lost in keeping the contents warm or cool – means reducing the ventilation through which indoor pollutants can escape, increasing certain health risks, for example. "A systems-based approach is needed to maximise co-benefits and minimise the negative unintended consequences," says Davies.

400K

THE AMOUNT OF DEATHS CAUSED BY MALARIA EVERY YEAR GLOBALLY, MOST OF THEM CHILDREN UNDER FIVE YEARS OF AGE.

Source: WHO

DOING THE GROUNDWORK

A second BOVA-funded initiative in Kenya, which combines the efforts of engineers, entomologists, social economists and public health experts, indicates just how far across disciplines a successful disease prevention initiative needs to stretch.

Led by Ulrike Fillinger of Kenya's International Centre of Insect Physiology and Ecology, the work is focused on the dirt floors common to so many homes in rural Africa. These are a fertile environment for sand fleas, which carry tungiasis, a parasitic skin disease that affects millions of people in Sub-Saharan Africa – especially children and the elderly – but attracts little attention from donors, scientists, governments and health workers.

The fleas do their early development on loose sandy soil. With few poorer householders able to afford concrete floors, this makes household floors – specifically those of children's bedrooms – infestation hotspots.

"VECTOR-BORNE DISEASE EXPERTS AND EPIDEMIOLOGISTS REMAIN LARGELY DIVORCED FROM ARCHITECTS, ENGINEERS AND URBAN PLANNERS"

Fillinger's work aims to develop an affordable hardened floor, combining traditional techniques, involving cow dung and mud soil mixed with locally available materials, such as coral dust, diatomite or volcanic dust, as well as state-of-the-art soil stabilisation technologies.

Engineers begin the process, developing and testing different floor technologies for durability and water permeability. Entomologists will test prototypes in trial houses to see how effectively they exclude the sand fleas, while public health experts monitor the house occupants for newly embedded fleas. Meanwhile, a social economist will investigate whether the floors appeal to homeowners and will work with the engineers to bring down their costs.

Researchers believe that if a low-cost flooring can be developed that's affordable for most families and subsidised or micro-financed for those that cannot afford it, it will reduce the prevalence of tungiasis and the suffering it causes.

→

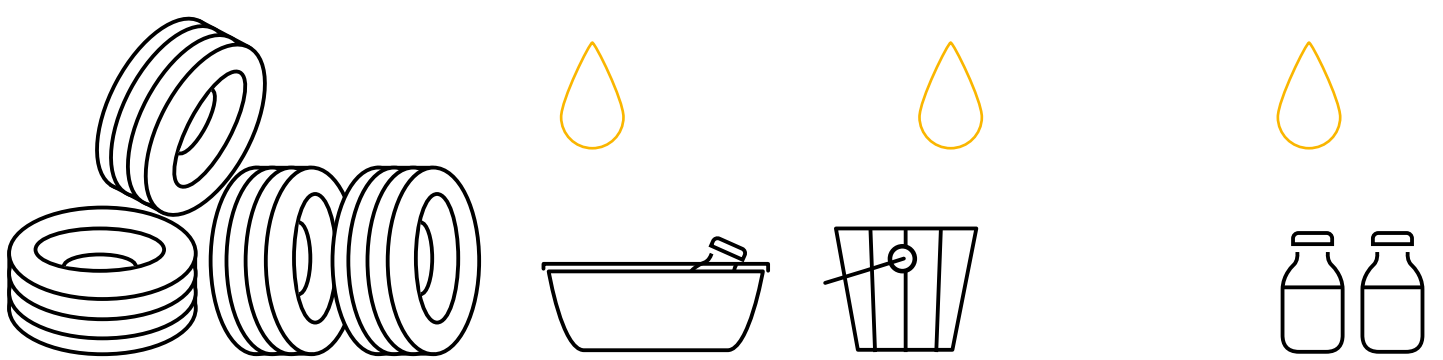
TRASH TO TREASURE

A cornerstone of BOVA's interdisciplinary approach is working closely with the local community. "Most of the time, the communities have the answers already. Initiatives like this are about communities and participation, going beyond architecture, buildings or the disease itself to see how communities can be engaged," says Dr Hector Altamirano, Associate Professor at the IEDE and BOVA Deputy Network Director.

He points to a third piece of research funded by the BOVA Network, designed to help local people establish profitable businesses to clear the built environment of the sort of objects that facilitate the spread of disease-carrying insects.

The rubbish that accumulates in a built environment – unused plastic containers, bottles, buckets, tires and so on – are perfect vessels for the small surface water pools in which disease-carrying insects love to breed. But they are also the ingredients of profitable trash recycling businesses, since much of the rubbish can be repurposed for a profit or sold on.

Consulting the local community, BOVA's Francis Mutuku and his colleagues at the Technical University of Mombasa in Kenya found that community members were keen to launch such businesses but lacked the start-up funds,



"TRASH IS THE MOST PRODUCTIVE MOSQUITO HABITAT IN THIS REGION, SO MUTUKU EXPECTS TO IMPROVE HEALTH BY REDUCING MOSQUITO-BORNE DISEASES – SUCH AS DENGUE AND CHIKUNGUNYA VIRUSES – AND TO ALLEVIATE POVERTY BY GENERATING INCOME"

mentorship, and skill-building they needed to do so. This is what the next stage of his work will provide. By helping start independent community-owned businesses, it circumvents the weakness of previous programmes in Kenya and Mexico, which worked only as long as donors or the government have been in place to pay local people to do the work.

Trash is the most productive mosquito habitat in this region, so Mutuku expects to improve health by reducing mosquito-borne diseases – such as dengue and chikungunya viruses – and to alleviate poverty by generating income.

The interdisciplinary element to initiatives like Mutuku's 'trash to treasure' project will have even more to offer as the global population, especially in the emerging world, expands. Africa is on the cusp of a continent-wide residential house-building boom, that will be required to accommodate its rapidly growing population – set to grow by 42% to 1.68bn in the 15 years from 2015 and 2030, according to the UN – in a manner that shifts citizens out of the informal slum-type accommodation that still predominates in many areas.

Focusing on the huge environmental and emissions consequences of this shift is only part of the puzzle, notes Davies: "You must ensure that the homes are still affordable and healthy to live in."

The lead provided by BOVA Network in joining up the work of discrete professions, organisations and government departments will be invaluable in ensuring that the built environment of tomorrow delivers everything it can to those it serves. If the Network succeeds in proving the concept of interdisciplinary work in such projects, it could have a fundamental influence on the health and welfare of the next generation. ■

READ THE RESEARCH

- BOVA Network: bovanetwork.org
- "Mapping changes in housing in sub-Saharan Africa from 2000 to 2015" (L. Tusting et al., *Nature*)
- "Participatory Action Research as a Framework for Transdisciplinary Collaboration: A Pilot Study on Healthy, Sustainable, Low-Income Housing in Delhi, India" (E. Nix, J. Paulose, C. Shrubsole, H. Altamirano-Medina, K. Belesova, M. Davies, R. Khosla, & P. Wilkinson, 2019)
- "Increased Threat of Urban Malaria from Anopheles stephensi Mosquitoes, Africa" (W. Takken & S. Lindsay, *Emerging Infectious Diseases*, 2019)
- "Reduced mosquito survival in metal-roof houses may contribute to a decline in malaria transmission in sub-Saharan Africa" (S. Lindsay, et al., 2019)

METAL-ROOFED IS MALARIA-PROOF

Research by Durham University's Professor Steve Lindsay, Principal Investigator and co-leader of the BOVA Network, suggests that the replacement of traditional thatched-roofed, mud-walled houses, with metal-roofed, cement block or brick-walled houses has helped combat the spread of malaria in sub-Saharan Africa.

Between 2000 and 2015, malaria infections in sub-Saharan Africa dropped by half and clinical disease by 40%, mainly due to the massive deployment of long-lasting insecticidal nets (LLINs), indoor residual spraying (IRS) and prompt diagnosis and treatment with effective antimalarials. However, in many places malaria started to decline before the large-scale implementation of malaria interventions.

An experiment by Professor Lindsay and colleagues published in May 2019 found that the mortality of Anopheles gambiae, the principal African malaria vector, was 38% higher in metal-roof houses than thatched ones. During the day, mosquitoes in metal-roof houses moved from the hot roof to cooler places near the floor, where the temperature was still high, reaching 35 °C.

In laboratory studies, at 35 °C few mosquitoes survived 10 days, the minimum period required for malaria parasite development. Analysis of epidemiological data showed there was less malaria and lower vector survival rates in Gambian villages with a higher proportion of metal roofs.

"Our findings are consistent with the hypothesis that the indoor climate of metal-roof houses, with higher temperatures and lower humidity, reduces survivorship of indoor-resting mosquitoes and may have contributed to the observed reduction in malaria burden in parts of sub-Saharan Africa," Professor Lindsay and colleagues conclude in the paper.

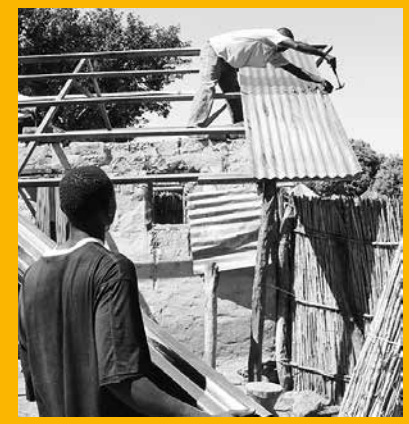


Image: BOVA

"IN LABORATORY STUDIES, AT 35 °C FEW MOSQUITOES SURVIVED 10 DAYS, THE MINIMUM PERIOD REQUIRED FOR MALARIA PARASITE DEVELOPMENT"

Source for data: "Mapping changes in housing in sub-Saharan Africa from 2000 to 2015" (L. Tusting, et al., *Nature*)

MAPPING HISTORY

WHAT COULD YOU DO WITH DATA ON EVERY BUILDING IN LONDON? COLOURING LONDON, AN OPEN KNOWLEDGE EXCHANGE PLATFORM THAT COLLATES, COLLECTS, GENERATES AND VISUALISES STATISTICAL DATA, AIMS TO BE THE FIRST PLACE PEOPLE GO TO FOR DATA ON THE CAPITAL'S BUILDINGS.

WORDS: GEORGE BULL

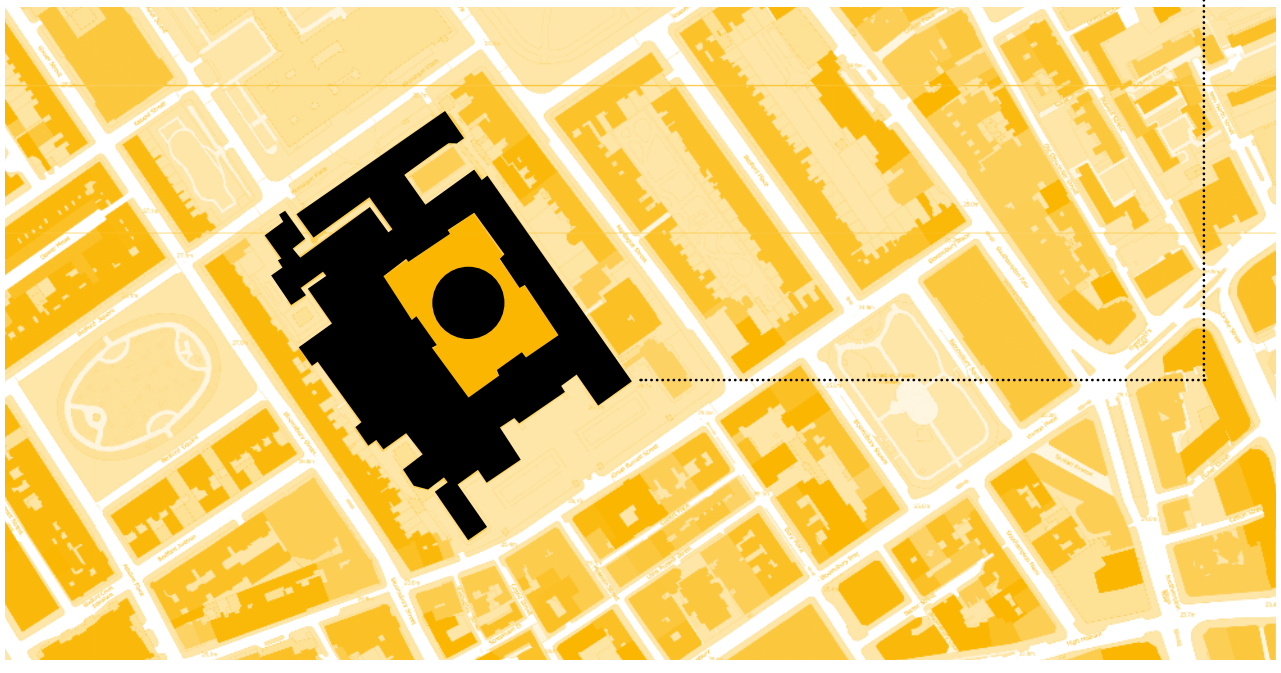
Illustration shows Southampton Row WC1B 5AN and the year in which each building was built.
Image: Colouring London

The principal physical component of cities is building stock. According to the International Energy Agency, buildings and the construction sector are also responsible for 36% of global energy consumption and nearly 40% of CO2 emissions – so it's also where the greatest potential for energy reduction lies. This energy agenda has, since the 1990s, been driving a paradigm shift in the European construction industry, from a focus on new buildings to building reuse. This in turn has led to an urgent demand for granular data on older buildings and urban stocks as a whole. "It has also shown how little urban scientists currently know about these slow moving systems and their operation over time, and it has highlighted the need for investment in analysis and data in this area," says Polly Hudson, Senior Research Fellow at The Bartlett Centre for Advanced Spatial Analysis (CASA).

Hudson's point is that, without data on the typology of buildings that make up our cities and their size, shape, age, use and how they're built, it's difficult to develop effective urban strategies to maximise sustainability in cities, or to measure and monitor their long-term performance. At the same time, being able to exploit the potential, and improve accuracy, of models able to generate 'what if?' planning and energy scenarios relies on having access to these statistical datasets. In the UK, these are highly fragmented and, in many cases, restricted, unverified and incomplete.

"THE CROWDSOURCING ELEMENT IS OF PARTICULAR INTEREST TO US AS A WAY OF ENGAGING THE PUBLIC AND IT IS A GREAT OPPORTUNITY TO RAISE AWARENESS OF AND PROMOTE ACCESS TO THE NATIONAL HERITAGE LIST FOR ENGLAND"

Image: Colouring London



BRITISH MUSEUM
Year built (best estimate): 1823
Core storeys: 3
Street: Great Russell Street
Town: Bloomsbury
Postcode: WC1B 3DG
Latitude: 51.5195
Longitude: -0.1269
In a conservation area?: Yes
Conservation area name: Bloomsbury
On the National Heritage List for England?: No

The British Museum. Image: Nicole Baster, Unsplash

"Outside the UK, comprehensive building-attribute data for cities are increasingly being released by governments as open data," says Hudson. She cites open property tax data released in the US and The Netherlands' Kadaster, which publishes building-attribute data including age and function, and which can be linked by any user to detailed building-geometry data to produce high-quality, colour-coded building-attribute maps for any Dutch city or town. Despite growing pressure from the open-data movement, such progress has been painfully slow in the UK. For example, though the Treasury has announced plans to open up Ordnance Survey's OSMM footprint data, its property tax database run by the Valuation Office Agency – which forms the most comprehensive building-attribute database for the UK – remains heavily restricted. "So despite such a resource existing, academic departments continue to have to rely either on aggregated or paid-for building-attribute data at city scale," explains Hudson.

In 2015, Hudson decided to take matters into her own hands as part of her PhD at CASA. The result, officially launched in October 2019, is Colouring London – an open, online, knowledge exchange platform designed to provide information on every building in the city. Developed over three years in partnership with Ordnance Survey, the GLA and Historic England, and in collaboration with the UCL Energy Institute (creator of the GLA London Buildings Stock Model) and the Survey of London, Hudson hopes that, by 2021, it will become the first port of call for open data on London's building stock.

Image: Colouring London

COLOUR-CODED CROWDSOURCING

Colouring London is collecting over 50 types of data for each building in London. To maximise simplicity, these are grouped as 12 core categories: Location, Land Use, Type, Age, Size & Shape, Construction, Streetscape, Team, Sustainability, Community, Planning, and Like me?. Tom Russell, Technical Architect and Lead Developer on the project, says he and Polly started out with a clear vision that the project would be volunteer-led and therefore the platform would need to be intuitive and easy to engage with. "That was the core challenge from a design and build perspective: how to make something that was technically as simple as possible but provided instant feedback for the user."

The solution was a simple gamification device: when a user edits a building and adds data, the colour of the building footprint changes according to the attribute value and the category of the data submitted (e.g. under 'Age', a building built between 1980–2000 will be coloured yellow; under 'Size & Shape', a building with 10–19 storeys turns orange). "Colour is fundamental to the project, not only in terms of the visualisation of data categories but also as a way of acknowledging each contribution," says Hudson. "The idea is also to stimulate users' curiosity to continue to reveal, and update changes to, the form of the city, in collaboration with other volunteers." The use of colour-coded London maps at building and block level also continues a long tradition that includes the Booth, London County Council (Bomb damage maps), Goad and the City of London maps.

Gillian Grayson, Head of Information Analysis, Policy & Evidence at Historic England, which funded its first phase, says they "immediately identified it as potentially valuable to the challenges we and London's local authorities face in managing change to the built environment". As well as putting Historic England at the heart of big digital data production and visualisation, Grayson envisages practical benefits for heritage planning and energy planning. For example, she cites the use of Colouring London as a tool to support Historic England's Heritage Action Zone initiative, which is a scheme to create economic growth and improve the quality of life in places, working with local people and partners. "The crowdsourcing element is of particular interest to us as a way of engaging the public. It is a great opportunity to raise awareness of the National Heritage List for England."

Key to the success of the project will be the ability of CASA's online system to drive high-quality data flows, both as uploads to the database and downloads from it for use in multiple applications. The platform not only needs to source, secure and visualise large-scale, fragmented, datasets, generate attribute using computational approaches, but also tap into the knowledge held by the 'crowd'. This includes the knowledge of residents, community-led planning groups, amenity societies, conservation bodies and built environment professionals, both in practice and retired.

CASA's Jaimie Denholm, Research Associate on Colouring London, led the testing with a community group in Somers Town, Camden. "They have a lot of historical knowledge but not in academic form."

"INCREASING ACCESS TO DATA ABOUT LONDON'S BUILDING STOCK HAS THE POTENTIAL TO ENABLE LESS ENERGY USAGE AND REDUCE CLIMATE CHANGE, AND TO LOWER THE COST OF LIVING IN LONDON. IT WILL BE GOOD TO SEE THE STORIES OF HOW PEOPLE ARE USING THIS DATA TO MAKE CITIZENS' LIVES BETTER"

UCL QUAD
Year built (best estimate): 1826
Street: Gower Street
Town: Bloomsbury
Postcode: WC1E 6BT
Latitude: 51.5195
Longitude: -0.1324
In a conservation area?: Yes
Conservation area name: Bloomsbury
On the National Heritage List for England?: No

UCL's Quad and Portico, Gower Street photographed in the 2000s. Image: UCL Image Store

For Denholm, this is the real potential of Colouring London: connecting people to the built environment around them and corralling all of this local knowledge into one place. Somers Town, a social housing development, has undergone huge changes over the past few decades, so Colouring London seemed like the perfect way to highlight its identity and heritage, and how to protect it.

"I have lived there my whole life," says Denholm. "I studied at UCL and have been involved in public engagement and outreach before, so I have this dual role. I've been able to use the platform to introduce people to the concept of conservation areas and how you go about about proposing one. The platform is ideal for showing the historical significance of buildings."

Citizens' views on whether they think the building contributes to the city are also collected within the 'Like me?' section. This category is designed to assist London's planning departments in harnessing difficult-to-access but important information on building performance, and to identify buildings that may be key socio-economic assets for local areas in future. It also enables the platform to begin to exploit the predictive ability of heritage and community planning groups, which in the 1960s and 1970s were to save, and foresee the socio-economic potential of now iconic, high-value areas of London, such as Covent Garden, Shoreditch, Whitehall and Bloomsbury.

"In some ways, locals can know a lot more about their buildings," says Philip Steadman, Emeritus Professor of Urban Studies and Built Form Studies at the UCL Energy Institute. "What's good about Colouring London is that it's about engaging these individuals and organisations. Its success will depend on how well it is taken up, but I think the age data they have is very promising and much better than anyone else's."

Each core data category is accompanied by a brief explanation of why the data are needed, along with tips on sources for those wishing to help colour the maps in. Another of the project's challenges is how to help users assess the reliability of data. For this Hudson says they are working to add a range of support features, including edit histories, sources and verification tools.

James Maddison, Consultant at the Open Data Institute, says that increasing access to data about London's building stock has the potential to enable less energy usage and reduce climate change, and to lower the cost of living in London. It will be good to see the stories of how people are using this data to make citizens' lives better, captured in Colouring London's data." ■

READ THE RESEARCH

• Colouringlondon.org

BUILDING HISTORIES

Amy Spencer, historian at the Survey of London, part of The Bartlett School of Architecture, on the Survey's early collaboration with Colouring London and the potential for the project to influence its own work in the future.

The Survey has been involved with Polly Hudson's research towards Colouring London from an early stage, and I've been excited to watch it develop over time. The team's research in South-East Marylebone (published in two volumes in 2017) coincided with a small portion of Camden, which was the pilot area for Polly's doctoral study. We were able to share data collected for South-East Marylebone, such as building dates, type and architect in gazetteer form. Our discussions with Polly then shaped the development of a database at the back-end of the Survey's Whitechapel website (www.surveyoflondon.org), which has given us the ability to enter data about particular buildings from our research in the area. The Whitechapel project was a collaboration with CASA, and the website was developed by Dr Duncan Hay.

Data on buildings in the UK is highly fragmented, often inaccurate and sometimes restricted by public bodies. I think Colouring London will make a valuable contribution to research connected with the built environment, with the potential to provide accurate and complete data for citizens, historians and researchers in energy, infrastructure, planning, urban systems and geography – facilitating and strengthening important research in other areas.

We're hoping that users will collect data from Survey of London volumes and upload it to Colouring London. This will open up our data (comprising anything from building dates to architects) to more people, and convert it into a format that will be useful to a wider range of researchers, including those using cutting-edge methods such as computing technology and mathematical analysis.

From my perspective, Colouring London will also be a valuable resource for the Survey. Our 'Histories of Whitechapel' project (funded by the AHRC) was an experiment in collaborating with the public, who contributed information, memories and images to enrich the Survey's research on a complex and diverse part of London. In a similar way, data collected on Colouring London may help to give us an initial overview of particular areas to contribute to discussions about future study areas, and also feed into the Survey's detailed research.

Whitechapel Road.
Image: Derek Kendall for the Survey of London.

THE ENERGY INSTITUTE'S ISLAND LABORATORY IS HELPING ISLAND NATIONS ALL OVER THE WORLD CHART POSSIBLE SUSTAINABLE FUTURES AS THEY'RE CONFRONTED BY THE CHALLENGES OF CLIMATE CHANGE AND RESOURCE SHORTAGES.

WORDS: BRENDAN MATON

PARADOX ISLAND

→

The image of an island paradise is strong in our imagination. So much so, that even literature warning of the vicissitudes of living surrounded by the sea chooses to illustrate messages of precariousness with photos of clear turquoise waters, white beaches and swaying palms. See the United Nations' website on 'Small Island Developing States' for examples of the paradox. It's much harder to find pictures of Harris or the Falklands during a wintry force-nine gale.

Some of the sunny gloss is understandable. Tourism is the biggest source of income for many islands, so they are habitually pictured at their best. Most are beautiful – even Harris, on a sunny day. Their biggest problem is trying to keep them that way. Rising sea-levels, a consequence of climate change, have already claimed thousands of islands. The Carteret Islands, part of Papua New Guinea, are just one-and-a-half metres from submersion and evacuation has already begun. Kiribati's 33 atolls in the Pacific Ocean could become uninhabitable by 2030.

Climate change is the man-made disaster that gets most attention with respect to island futures but there are others, including waste disposal (both local and international) and the consequent degradation of fishing zones. These problems are not just for beauty spots or poor places, either. Several islands around the world have been abandoned or will have to be – even the Tangier Islands in Chesapeake Bay, Virginia – a US territory – have been shrinking since 1850 and may become uninhabitable in 50 years' time, according to *Nature* magazine.

For poorer island economies such as Kiribati, whether independent or related to a larger landmass, considerations about how to survive have to be taken carefully because their means are far more limited. This is where The Bartlett's Energy Institute's new Islands Laboratory comes in. The team of mathematicians, economists, engineers, lawyers, geographers, environmentalists and physicists helps island authorities work out how to tackle the greatest challenges to their people and economy. "People come to us with their problems. They know what they are and they have a lot of information on them. But they don't know how to solve them," says Dr Catalina Spataru, Associate Professor of Global Energy Resources at the Energy Institute and the founder of the Islands Laboratory.

"THE IMAGE OF AN ISLAND PARADISE IS STRONG IN OUR IMAGINATION. EVEN WARNING LITERATURE CHOOSES TO SHOW PHOTOS OF CLEAR TURQUOISE WATERS, WHITE BEACHES AND SWAYING PALMS"

NO ISLAND IS AN ISLAND

Spataru's team models scenarios for clients' particular dilemmas in order to help them select the best changes for the future. So far, 360 case studies have been made, of which approximately 200 are focused on energy, while 160 study the resource nexus. This brings together land and water usage, commodities and minerals, because on an island, policy change tilted at one resource invariably affects all others.

Take desalination. Plenty of islands need more reliable sources of drinking water, either because there are few fresh sources (such as on Cabo Verde, Aruba) or because their aquifers are at risk from sea flooding (e.g. the Marshall Islands). Tourism and agriculture – the most common island industries – are thirsty consumers.

Images: Unsplash

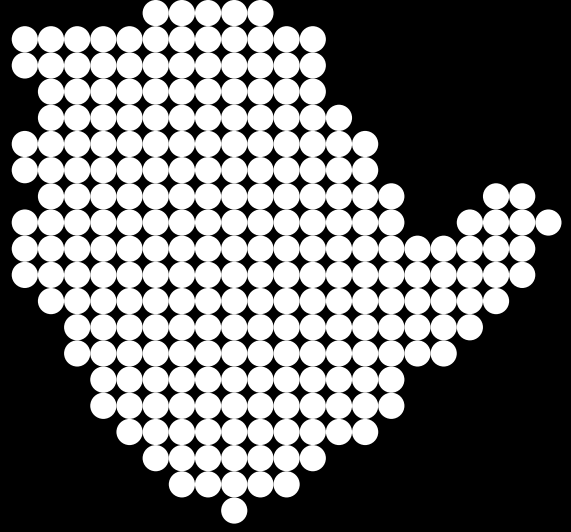
Converting seawater is technically possible and tempting to those entirely surrounded by it. But even filtering seawater through a membrane (reverse osmosis) takes energy. Few islands have this combination of abundant energy and scant water. So the Islands Laboratory models for authorities where desalination makes sense in the context of all their competing demands for energy and freshwater.

As an introduction to the energy and resource nexus, the Islands Laboratory has developed an interactive map of the world's populated islands, including definitively non-tropical getaways such as Anglesey (North Wales) and Sheppey (Thames Estuary). The map gives a casual searcher the basic facts on population, income, energy expenditure and water consumption on all these islands. But Spataru warns of the gap between information on the map and the complexity of the case studies:

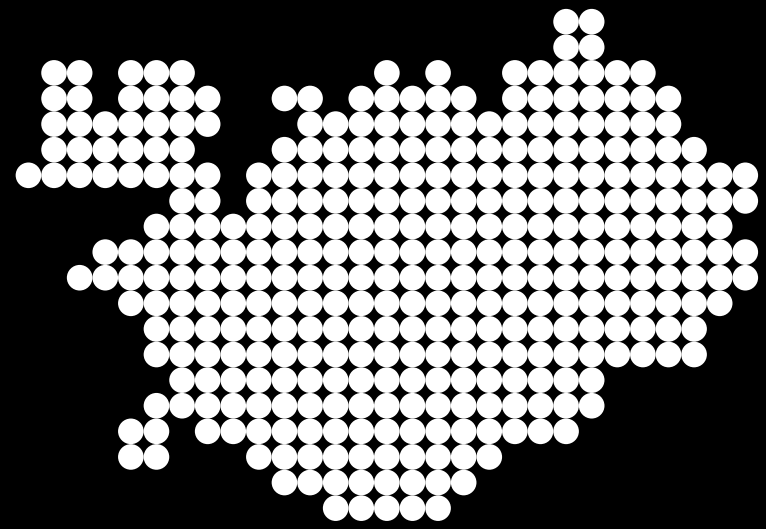
"Most islands around the world are at various stages along the road to evolutionary energy efficiency, transport and resources development processes, which are characterised by different views about ownership and use, for example, and driven by different policy- and decision-makers' models," she says.

This leads to the promotion of different measures at different points in time: snapshots from the map don't reveal the whole story. For island leaders, their communities and external donors such as the World Bank and United Nations, it is the scenario-modelling in the case studies that is so valuable in deciding which path they take for the future.

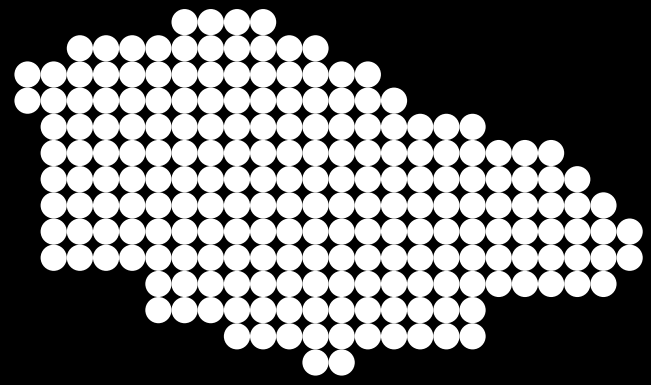
A good example would be the research the Islands Laboratory undertook on the Cyclades, the Dodecanese, Crete and Skyros in Greece, where the local authorities recognised that their power supply could be improved but needed some estimates and technical expertise to put figures on that possible improvement. As an EU Member State, Greece has pledged to reduce greenhouse gas emissions by 40% by 2030. Yet austerity has left many worthwhile projects in energy adaptation unrealised. Although less than 12% of the country's population live on islands, they emit more than their fair share of polluting gases because much of their energy is supplied by old-fashioned diesel and heavy-fuel power stations. This is a common predicament for islands remote from plentiful sources of energy – such power stations have the advantage of autonomy, which means they can be relied upon in any kind of weather (in contrast, the Greek government has put a 30% limit on wind energy's contribution to the local grid because of its intermittency). But burning diesel doesn't help Crete, Skyros or any other island meet national commitments to sustainability. There is also the fact that energy on the islands is subsidised by mainlanders. They might prefer to pay less for their insular peers to use cleaner power.



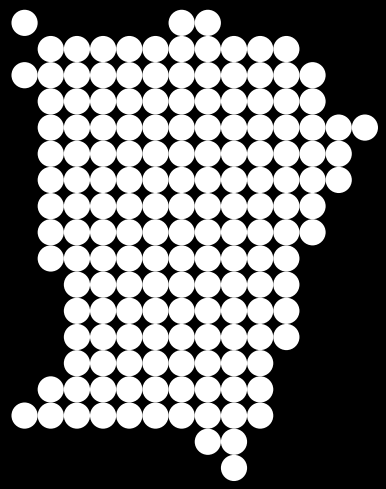
32%
NATURAL GAS
ANGLESEY
Other sources:
Electricity 28.1%
Oil 27.8%
Coal 4.5%



67.7%
RENEWABLES
ICELAND
Other sources:
Hydro 20.7%
Oil 9.6%

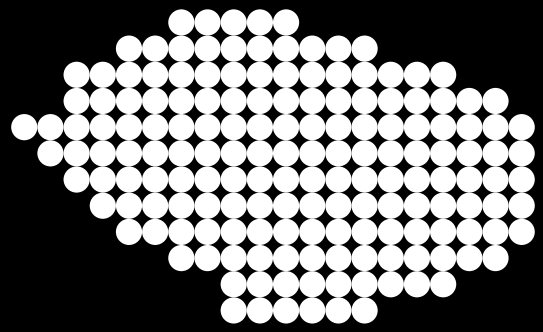


90.9%
OIL
GOZO
Other sources:
Renewables 4.7%
Natural Gas 3.4%

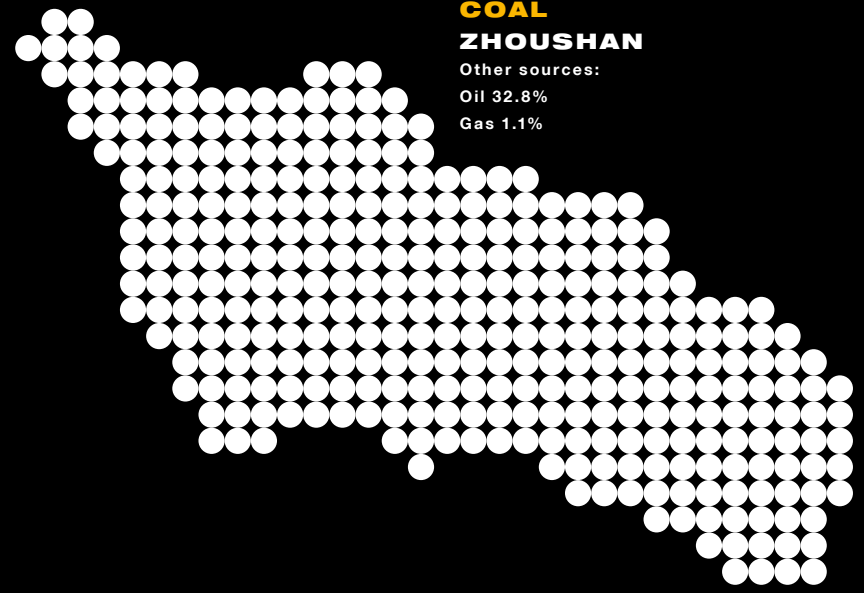


57.3%
OIL
PENANG ISLAND
Other sources:
Natural Gas 28.3%
Electricity 14.3%

48.7%
NATURAL GAS
SAMOTHRACE
Other sources:
Oil 33.7%
Solar 11.1%
Biomass 5.3%
Hydro 1.2%



63%
COAL
ZHOUSHAN
Other sources:
Oil 32.8%
Gas 1.1%



This graphic shows the energy supply mix of six islands around the world using data from demonstration case studies produced by the Islands Laboratory. There are 416 case studies in all and these are gradually being added to the Laboratory's website at islandslaboratory.com

MACRO ISLANDS NATIONS

REFER TO ISLANDS WITH A GREATER THAN 35 MW AND 100 GWH ENERGY REQUIRED AND A POPULATION GREATER THAN ONE MILLION.

MESO ISLANDS NATIONS

REFER TO ISLANDS WITH A LESS THAN 35 MW AND 1000 GWH ENERGY REQUIRED AND A POPULATION BETWEEN 100,000 AND ONE MILLION.

MODELLING TRANSITION

In 2017, Island Laboratory researchers Eleni Zafeiratou and Catalina Spataru modelled how much electricity cables from the Greek mainland, connecting the Aegean islands to cleaner energy production, would cost and how much they would save.They factored in Business as Usual (i.e. maintaining the existing power stations). Crucially, they also calculated energy efficiency.

The headline conclusion was that savings of up to €17.8bn could be made between 2015 and 2040, subject to demand growth and fuel price costs. The carbon footprint could be up to two-thirds lighter than the Business-as-Usual case. Under one optimistic scenario, energy from renewables will actually get exported back to the mainland – turning subsidy into benefit.

But there are significant other aspects to energy transition, which go even beyond the resource nexus. For example, the architecture of the Cyclades islands is recognised around the world for its white buildings, occasionally topped with blue domes on ecclesiastical buildings. The sight of solar panels nearby would diminish this view. Hence, the Energy Institute researchers recommended flat panels on larger (modern) hotels in the Cyclades, given that hotels account for up to 40% of electricity use on tourism-dependent islands.

Similar considerations have to be made for wind turbines – suitable for much of the Cyclades but arguably not in keeping with the image of these places as 'unspoilt'. For many islands, Zafeiratou and Spataru have measured where best to place new turbines for optimal efficiency but also in keeping with existing regulations and planning expectations. The latter interact with local sentiment for change to their landscape – the pros and cons.

This brings us back to the paradox of paradise islands, forgotten by civilization and better for it, according to our romantic imagination and the tourism industry. The reality can be quite different for the local population. So many young people have left their native Greek islands to seek better opportunities abroad that the Islands Laboratory has had to include new modes of transport for an ageing population in its research there. Such a holistic approach has been acknowledged by the Global Islands Partnership (GLISPA), which works at a governmental level to share knowledge, best practice and funding mechanisms for sustainable and resilient communities.

MICRO ISLANDS NATIONS

REFER TO VERY SMALL AND SMALL ISLANDS WITH A LESS THAN 5MW AND 15GW ENERGY REQUIRED AND A POPULATION LESS THAN 100,000.

Funding and governance matter greatly, according to Spataru. "Despite the fact that numerous islands have presented and introduced plans to advance renewable energy deployment, the policy design and execution is frequently behind," she says. "More emphasis needs to be given to the sustainability of energy investments, business models and financing modalities that provide ownership and to the contribution of consumers and other stakeholders. This requires a strong role for commercial banks and lending agencies. Testing business models in practice and putting solutions into effect should be at the top of the pyramid of priorities for the islands."

The world has a duty to assist island inhabitants with testing these new models and solutions – for all kinds of reasons. Islands' relative isolation means that they host far more biodiversity than large land masses (the Philippines has twice as many endemic species as the US, for example). But the vulnerability of some islands to climate change means they need help fast. Pacific Islanders who have already fled their sinking homes to plead refugee status in richer countries have seen their claims turned down. These people were not responsible for their loss of land but international law has so far rejected climate change as a justifiable basis for forced departure from paradise and the search for refuge. ■

READ THE RESEARCH

- Islands Laboratory: islandslaboratory.com
- "Transitioning island nations into sustainable Energy Hubs: Emerging research and opportunities" (C. Spataru, IGI Global, 2019)
- "Potential economic and environmental benefits from the interconnection of the Greek islands" (E. Zafeiratou, C. Spataru, *International Journal of Global Warming*, 2017)
- Global Island Partnership: glispa.org

A DIFFERENT WAY OF SEEING

CREATING AN INCLUSIVE BUILT ENVIRONMENT INDUSTRY STARTS AT SCHOOL. FROM A GROUNDBREAKING EXPERIMENT TO TEACH VISUALLY IMPAIRED STUDENTS TO INITIATIVES TO WIDEN PARTICIPATION, THE BARTLETT WANTS TO OPEN UP BUILT-ENVIRONMENT EDUCATION TO A MORE DIVERSE COHORT.

WORDS: VERONICA SIMPSON

Open crits at The Bartlett School of Architecture.
Previous page: Students at Here East. Images: Richard Stonehouse

With environmental, political, social, cultural, and financial pressures intensifying, The Bartlett School of Architecture is taking steps to ensure its teaching and portfolio of programmes remains relevant, valuable, attractive and accessible. For many students, the greatest challenge is managing debt, not only over their period of study, but also in the early years of their careers. Rising costs are presenting unprecedented obstacles for those from middle- to lower-income backgrounds, and set against the extended period before they are fully salaried, alternative pathways such as apprenticeships are becoming attractive. For these reasons, among others, The Bartlett began looking into whether an alternative version of the traditional Part 1 and 2 structure might be viable, as well as desirable.

After extensive consultation with students, staff, practitioners and experts, Sara Shafiei, former Architecture BSc (ARB/RIBA Part 1) Programme Director, together with Stephen Gage, Professor of Innovative Technology, developed and proposed a radical five-year integrated Master's degree – Architecture MSci – now recruiting its first intake of students for autumn 2020. The new degree integrates the development of architectural design skills with an understanding of the complex social and technical environments in which buildings are produced. It will run in parallel and in dialogue with the school's Architecture Part 1 and 2 programmes.

The model includes a final year on placement in practice after four years of study, as well as a thematic integration of practice and academia from day one, giving students the opportunity to accelerate their career as an architect. Students spend the first four years developing their understanding of architecture through a comprehensive curriculum, addressing key world issues such as social housing, climate change, sustainable cities and global health and wellbeing. Through their investigations, they will identify a research area of particular interest, which will shape their choice of practice placement. During the placement year, students will learn about architectural practice at first hand. More than 20 national and international architecture practices have contributed to the development of the programme throughout its planning and keenly await contact with the cohort in the coming years.

Architecture MSci is currently seeking RIBA and ARB accreditation for Part 1 and 2. Commenting on the programme, Shafiei says: "We're proud to be taking a fresh approach to training tomorrow's architects and responding to the need for alternative routes to registration. This programme reinforces our commitment as a school to train graduates for world-leading practices, responding to the global challenges of our time. It's a radical alternative to achieving Parts 1 and 2, seeking to attract highly talented individuals, including those who might otherwise choose not to apply to study architecture at all." ■

"IT'S A RADICAL ALTERNATIVE TO ACHIEVING PARTS 1 AND 2, SEEKING TO ATTRACT HIGHLY TALENTED INDIVIDUALS, INCLUDING THOSE WHO MIGHT OTHERWISE CHOOSE NOT TO APPLY TO STUDY ARCHITECTURE"

READ THE RESEARCH

- Architecture MSci: ucl.ac.uk/bartlett/architecture/programmes/undergraduate/architecture-msci

ARCHITECTURE BEYOND SIGHT

Any comprehensive programme of widening access must include those with disabilities, but developing an architecture course for blind or partially sighted people is a remarkable idea – one championed by The Bartlett's previous Dean, Alan Penn. This is being led by Senior Lecturer Jos Boys, together with The DisOrdinary Architecture Project, a platform enabling disabled artists to work creatively with the architecture sector on improving access and inclusion.

Boys says: "He was worried that a lot of architecture education is focused on the visual. Drawings and plans are describing one particular thing about buildings: the formal, compositional aspects. You don't have any way of recording sound or atmosphere or smell. Those things get lost. You look at acoustics but they become an add-on." Furthermore, the usual, purely visual representations "are often incomprehensible to someone who hasn't studied the discipline".

So Boys and a group of blind and partially sighted artists from DisOrdinary have been co-creating and testing a course that deliberately teaches architecture beyond the visual. An initial, three-day development workshop looked at alternative modes of designing, from physical modelling to full-size body sketching, to performative audio-descriptions to drawing on paper that has been placed on a rubber mat to create a visual line on one side and a raised edge on the other. Boys says: "We were looking at what it is that matters about space, about how much blind and visually impaired people already know. They often know things and notice things that sighted people don't."

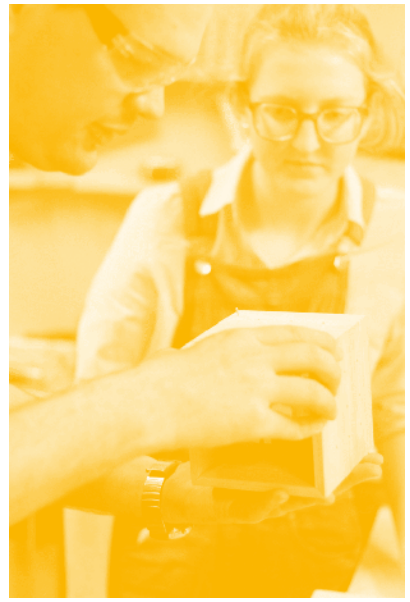
Following on from this, the team produced a prototype foundation study week called Architecture Beyond Sight, which took place in July 2019, led by blind American architect Chris Downey and blind Tasmanian furniture maker Duncan Meerding, with 16 blind and visually impaired students participating. "Some of these people are already studying but haven't told anyone that they've got a visual impairment." says Boys. "They are worried their tutors will stop taking them seriously. We have people in practice who, again, don't tell their employers, they just manage the situation." And yet visual impairments affect "10% or 15% of the population and it's hidden. We're hiding it from ourselves because we're not allowing it to be part of the diversity of humanity".

Boys hopes that such a course will be part of improving the accessibility of The Bartlett's buildings more generally. Meerding – who works mainly in wood – and the B-Made workshop team collaborated on improving the workshops to better support blind and partially sighted students, in ways that will benefit their usability and safety for everyone. Boys also reports growing interest in a more multi-sensory appreciation of architecture from many students and staff. An audio-described tour and a sign-language tour of the degree show this year proved hugely popular, she says. "Students were beginning to see how they might not only exhibit their work but also occupy the building differently. The tutors too were open to those thoughts." If a teaching and business model can be established, "it would be the first in the world. That would be amazing for The Bartlett. And it would mean a cultural shift everywhere." ■

READ THE RESEARCH

- DisOrdinary Architecture Project: disordinaryarchitecture.ac.uk
- Architecture Beyond Sight Planning workshop video: vimeo.com/296974975
- "Doing Disability Differently: Architecture, Dis/ability and Designing for Everyday Life" J. Boys (Routledge 2014)

"SOME OF THESE PEOPLE ARE ALREADY STUDYING BUT HAVEN'T TOLD ANYONE THAT THEY'VE GOT A VISUAL IMPAIRMENT"



Photographs from the Architecture Beyond Site study week in July 2019. Images: DisOrdinary Architecture

“WE HAVE GOT TO ASK: ‘WHY DO WE HAVE THE SYSTEM THAT WE HAVE?’ OTHERWISE WE WILL ONLY EVER BE TINKERING AT THE EDGES”

Image: Tim Crocker

“WHEN YOU HAVE EXPERIENCED GROWING UP AS A MINORITY, IT GIVES YOU A PARTICULAR UNDERSTANDING OF THE WORLD. IT’S A DIFFERENT WAY OF SEEING AND VALUING”

WIDENING PARTICIPATION

In wider society, as well as in academia, gender and racial equality have become the hottest priorities. This shift has led to the appointment of Kamna Patel, an Associate Professor in the Development Planning Unit, as The Bartlett’s Vice Dean for Equality, Diversity and Inclusion (EDI). Now one year into a three-year term, she is keen to tackle the subject from a systemic point of view, looking at loosening up the structures that reinforce inequality. “We have got to ask: ‘why do we have the system that we have?’ Otherwise we will only ever be tinkering at the edges of inequality,” she told the UCL Education Conference 2019.

Patel says: “The starting point we have taken is data led. What does UCL look like in terms of students and faculty?... When it comes to undergraduates, we tend to attract, and therefore select, from quite a narrow social cohort. It’s a cohort that can afford to come to London and study in London for several years.” So there is a drive to diversify the intake, which goes beyond widening participation programmes of engagement in less advantaged schools and regions (such as Access UCL). She is looking at the way the university communicates to potential students, as well as whether potential students from The Bartlett’s home city of London might see a community that reflects a broad range of ethnicities, including theirs, when they come and visit (which it currently doesn’t, says Patel, especially among teaching staff). There will also be a shift in recruitment procedures. The bland uniformity of UCAS application forms makes it harder to identify particular qualities beyond the academic that might make a candidate suitable, but postgraduate students, through their personal statements, can reveal candidates who have, for example, demonstrated resourcefulness and resilience in real life situations, says Patel.

Regarding diversity among teaching staff, Patel’s research has found that shifts could be achieved through honing the curriculum to include sectors and geographical areas where a rich seam of existing BAME expertise could be found. She is also hoping to level the playing field for promotion and draws on changes that have already been made across UCL. She explains: “Previously there was a perception that the only thing that mattered was research… Now in promotion cases a fairer weighting is given to teaching and institutional work. There is an understanding that women tend to do these roles more. So rewarding that has meant making structural changes.”

She sees these changes as being not just beneficial to The Bartlett, but “beneficial for the entire industry. Construction and built-environment professions are very white and male-dominated. So how do we change that up? This is not a matter of putting diverse bodies into places and thinking things will change. When you have experienced growing up as a minority, it gives you a particular understanding of the world: it’s not just about empathy, it’s a different way of seeing. This is about harnessing that different way of seeing and valuing it, not just taking these diverse people and pushing them into a particular mould.”

All these access and diversity measures dovetail with The Bartlett Promise, an initiative instigated by previous Dean Alan Penn, to waive fees and provide a living stipend to a small cohort of students who otherwise would not have access to the school or these professions. Penn states: “My view has always been that you cannot have an excellent education without a diverse cohort.” As a legacy of The Bartlett’s centenary, which it celebrated in 2019, a more diverse and equal faculty at all levels would be hard to beat. ■

READ THE RESEARCH

- The Bartlett Promise ucl.ac.uk/bartlett/bartlett-promise
- UCL Access and Widening Participation ucl.ac.uk/widening-participation

ANATOMY

IN THIS SECTION, WE GO INSIDE THE ANATOMY OF THE BARTLETT TO EXPLORE THE BIG STORIES HAPPENING AT FACULTY LEVEL, FROM COLLABORATIVE PROJECTS, NEW PROGRAMMES AND BUILDINGS TO 2019 IN NUMBERS.

Sir Herbert Henry Bartlett.
Image: UCL Special Collections

100 YEARS OF THE BARTLETT

THE BARTLETT TURNED 100 IN 2019, MARKING A CENTURY SINCE SIR HERBERT HENRY BARTLETT BECAME OUR NAMESAKE. WE RAN A YEAR-LONG CAMPAIGN TO CELEBRATE, EXPLORING 100 YEARS OF RADICAL THINKING, RESEARCH AND COLLABORATION THROUGH STORIES AND EVENTS.

A new story about The Bartlett was published at midnight every day for 100 days, from 4 February to 14 May 2019 on Bartlett100.com

Opposite page: Quote from Professor Alan Penn, Dean, The Bartlett (2009–2019).

100 STORIES IN 100 DAYS

Our centenary celebrations started with 100 stories published over 100 days on our campaign website Bartlett100.com and promoted on social media. Each story offered a different perspective on The Bartlett from a different moment in time over the past century.

Stories were sourced via a questionnaire completed by each of our schools and institutes to uncover the people and projects that have shaped the faculty, as well as the work we're doing now to redefine the built environment for the next 100 years.

Two researchers were also commissioned to write short histories of all the buildings The Bartlett has inhabited, as well as a historical timeline of the faculty and a profile of our namesake, Sir Herbert Henry Bartlett.

"OUR CENTENARY PRESENTED AN EXCITING OPPORTUNITY TO ACKNOWLEDGE THE PAST AND MAP A PATH FOR THE FUTURE"

A bust of Sir Herbert Henry Bartlett by Charles Leonard Hartwell R.A. made in 1922. Image: The Bartlett Archive

THE LIFE OF SIR HERBERT HENRY BARTLETT

In 1911, Sir Herbert Henry Bartlett, a civil engineer and building contractor, gave a £30,000 donation to UCL to fund a new building to house the School of Architecture, along with the Department of Applied Statistics and studios for the teaching of sculpture.

Bartlett was the sole proprietor of Perry & Company, a civil engineering firm based in Bow, East London, and responsible for a number of significant building projects in London throughout the second half of the 19th century, including Tower Bridge, Waterloo Station and St. Thomas' Hospital.

He chose to remain an anonymous donor to UCL until 1919 when he consented to his name being revealed, and consequently the faculty being named after him.

MOST POPULAR STORIES BY VIEWS OVER THE FIRST 100 DAYS

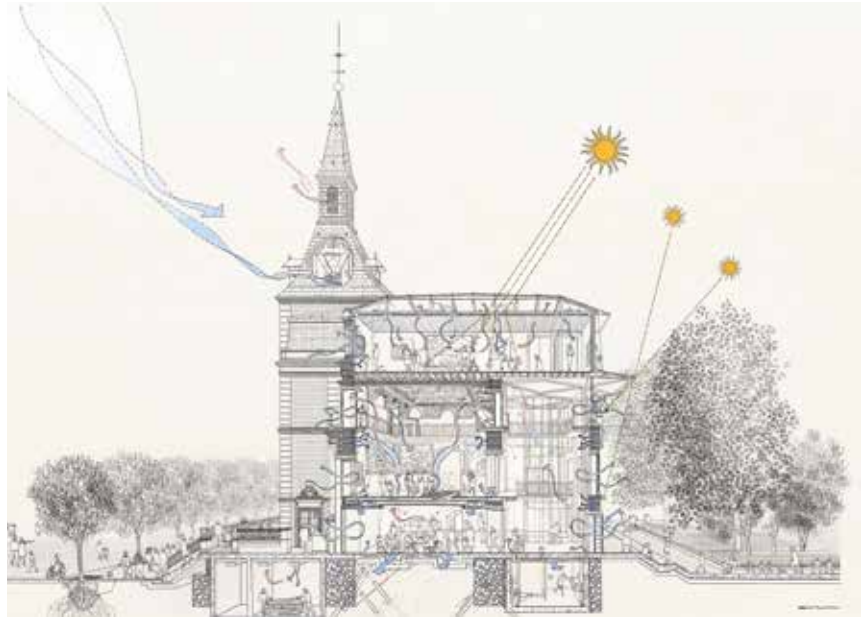
A new way of mapping the city
Open-data platform Colouring London is redefining the use of city building data.

Ruth Glass on coining 'Gentrification'
Sociologist Ruth Glass coined the term 'gentrification' in 1964 to describe change in London.

What can maps tell us about society?
How spatial analysis of historical maps can reveal more than statistical data.

How building layouts drive social interaction
Understanding how the design decisions of architects have an impact on people's behaviour within buildings.

How to manage a megaproject
Helping Crossrail break the mould in UK construction.

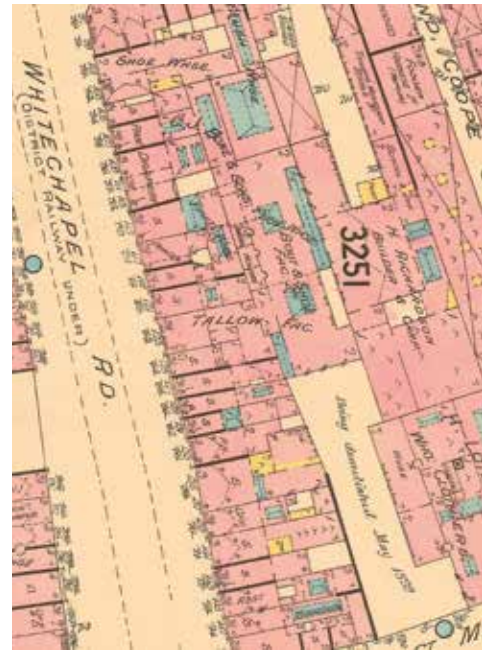


[1] Story 16/100

[2] Story 03/100

[3] Story 14/100

[4] Story 02/100



[5] Story 30/100

Read all the stories at
bartlett100.com

[6] Story 29/100

[1] Prado Museum Extension. Image: Foster + Partners [2] Heathrow Terminal 5 (T5) under construction. Image: BAA. [3] Cover of *London: Aspects of Change*, published by the Centre for Urban Studies at UCL in 1964. [4] Bartlett alumnus Nick Wates, North Gower Street, 1974. Image: *Tolmers in Colour: Memories of a London Squatter Community.* [5] Section of the Goad Plan of 1899. Image: Crown copyright and Landmark Information Group [6] London 2012 Aquatics Centre in the Queen Elizabeth Olympic Park, Stratford. Image: Hufton + Crow.

CELEBRATING OUR ALUMNI

More than 20 Bartlett alumni were interviewed as part of our 100 stories, spanning the breadth of the faculty. There's alumnus Nick Wates, who shared his story of community activism at Tolmers Square. There are interviews with lighting designer Florence Lam (Arup), architect Narinder Sagoo (Foster + Partners), founder of FutureBricks Arya Taware, and bestselling author and academic Lesley Lokko. And there are profiles of those no longer with us, such as Selwyn Goldsmith, who invented the dropped curb.

THREE OF THE BIGGEST EVENTS BY ATTENDANCE

Symposium: Healthy and Sustainable Places
Exploring the rise of the wellbeing agenda among building designers and urban planners. Organised by the Institute for Environmental Design and Engineering.

Conference: The Case for Affordable Housing
Exploring global case studies focused on new tools and models for financing affordable housing. Organised by the School of Construction and Project Management.

Workshops: Real Estate: The Next 100 Years
Exploring how the buildings that we create today will be used in 100 years' time; who will own, manage and occupy them, and digital technology will change the way we use buildings. Organised by the Real Estate Institute.

Launch night of exhibiton 'The Next 100 Years'.
Image: Ondre Roach

Interactive exhibition 'The Next 100 Years' at 22 Gordon Street.
Exhibition design by Boyle & Perks. Images: Ana Escobar

THE BIG QUESTIONS FOR THE NEXT 100 YEARS

Our 100 stories series culminated in an interactive exhibition, which ran from 2–18 May 2019 in the ground-floor space at The Bartlett's headquarters, 22 Gordon Street. 'The Next 100 Years' was designed to provoke ideas about where the built environment is succeeding or failing, and invited visitors to tell us what they thought were the most important questions it faces over the next century.

From the hundreds of responses the exhibition received, 12 core themes emerged, which have formed the foundation of Our Commitment to Change. This is an ongoing project that is helping to shape how The Bartlett will build a better future. You can find out more about it at: ucl.ac.uk/bartlett/build-a-better-future

Delegates at The Bartlett's Case for Affordable Housing Conference. Image: Kirsten Holst

100 EVENTS FROM LONDON TO SIERRA LEONE

From lectures to open days, conferences to workshops, panels, book launches, installations, pavilions and performances, Bartlett 100 ran a packed events calendar throughout 2019.

In the run up to the centenary year, each school and institute was invited to pitch an idea for an event they would like to curate as part of the Bartlett 100 celebrations. Selected events were then given financial and logistical support by the faculty team, and promoted via Bartlett100.com, a biannual campaign events flyer and social media. Bartlett 100 also became a partner brand for exisiting events across the faculty.

The breadth of the events reflected the diversity of expertise at The Bartlett: a lecture on public service delivery, a conference exploring the next real-estate century, pavilions by The Bartlett's MEng students, a conference on urban development in Sierra Leone, and much more.

Tribal Gathering – a series of pavilions by first-year Engineering & Architectural Design MEng students at Here East. Image: Richard Stonehouse

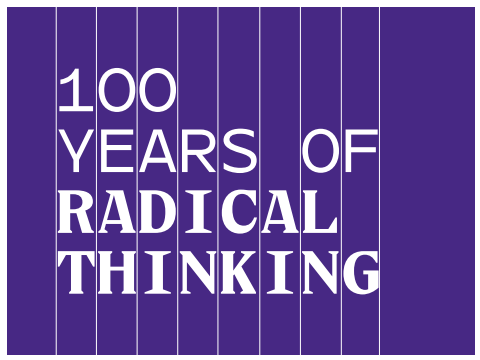
“THE CHALLENGE AROSE WHEN DESIGNING THESE MONOSPACED FORMS, DUE TO UNCOMFORTABLE MOMENTS WHERE LETTER WIDTH AND SPACING CREATE A CONFLICTING BALANCE. BUT IT’S THESE MOMENTS THAT GIVE THE FONT ITS ESSENTIAL CHARACTER”

Bartlett 100 brand by Eggcorn; custom typeface by Colophon; tote bag design by Boyle & Perks.

Bartlett 100 Serif

Bartlett 100 Sans Regular

Bartlett 100 Sans Bold



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Bartlett 100 Sans Regular

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Bartlett 100 Sans Black

TELLING STORIES WITH CUSTOM TYPE

A central feature of The Bartlett 100 brand was a custom typeface created by font foundry Colophon. The brief was to create a distinctive display typeface that felt celebratory but challenging; that was progressive without being futuristic; and that was accessible for a digital-first campaign.

Edd Harrington, Co-founder of Colophon, says that the challenge led them to look into the notion of ‘radical’ and how this could be appropriated to a system. He says the concept became how “a single defined space would determine the stylistic qualities of the letterforms”. This led to the use of a ‘fixed pitch’ or monospaced system where each letter occupies the same amount of space.

“The challenge arose when designing these monospaced forms, due to uncomfortable moments where letter width and spacing create a conflicting balance. But it’s these moments that give the font its essential character.”

The font has Serif, Sans Regular and Sans Bold styles. Two styles and two colours are always used together to emphasise the value of collaboration in creating new forms and ways of seeing things differently.

The Bartlett 100 book designed by Eggcorn. Images: Eggcorn

100 YEARS IN 100 STORIES IN 248 PRINTED PAGES

The year-long Bartlett 100 campaign culminated in the publication of a book compiling all 100 stories published on Bartlett100.com, together with full-bleed photography from featured projects and from The Bartlett and UCL archives.

Printed on high-quality paperstocks in two special colours, The Bartlett 100 book is a commemorative publication and physical record of the faculty’s history. The book had a limited print run and copies can be found in The Bartlett library at Central House. ■

THE EDGE OF TOMORROW

UCL EAST, THE UNIVERSITY'S LARGEST SINGLE EXPANSION IN 200 YEARS, HAS A RADICAL ACADEMIC VISION: TO CONFRONT THE CHALLENGES OF THE 21ST CENTURY THROUGH EXPERIMENTATION AND COLLABORATION BETWEEN MULTIPLE FACULTIES, DISCIPLINES AND ACTORS, SHARING SPACE IN NEW WAYS.

WORDS: GEORGE BULL

Aerial view of Queen Elizabeth Olympic Park, home to the UCL East campus. Image: London Legacy Development Corporation. Opposite page: Illustration of the atrium, Marshgate. Image: Glass Canvas.

Professor Paola Lettieri, Academic Director of UCL East, says that the new campus will bring together, and give life to, the true transdisciplinary nature of UCL. Eight of the university's 11 faculties are involved in expanding to two new buildings on its East London campus. The Bartlett, alongside UCL Engineering, Life Sciences, and Arts & Humanities, has been involved from the start. Its pioneering venture – with UCL Engineering – in the Queen Elizabeth Olympic Park at Here East, which opened in 2018, was phase zero for the university's long-term plans.

Lettieri is happy to say that the academic vision for the campus is already playing out at Here East, albeit on a smaller scale. "The modus operandi is there, which is the exposure of students to different disciplines. At UCL East we are going to reproduce that openness and transparency, with the concept of fluid zones and large, open atriums, so that whichever floor you're on, you can look up or down and see what's going on. Currently we don't have that in our buildings in Bloomsbury. So we're creating a natural situation where colleagues from all the various departments will encounter each other."

The first two buildings, Pool Street West (2022) and Marshgate (2023), are paving the way to a different mindset, she says, a different way of thinking about how a university should work. "What kind of teaching, what kind of academic research, what kind of students, do we need to produce?" says Lettieri. "Having different programmes in the same space will naturally enable the cross-pollination of ideas, but here we are experimenting with making these interconnections more visible." Lettieri emphasises that this isn't about annihilating boundaries but revealing the value of being in the space, of people understanding each other more. "The philosophy at Here East is a strong example of the academic vision for UCL East."

Previous page: Hoarding outside the construction site for Marshgate. Above from left: Kevin Argent (Deputy Director of UCL Estates & Director of Estates Development), Paola Lettieri (Academic Director for UCL East) and Michael Arthur (UCL President & Provost) at the UCL East breaking ground ceremony, July 2019. Images: Richard Stonehouse.

Pool Street West will be home to the Future Living Institute. There will be an Urban Room and Memory Archive on the ground floor, curated by the Urban Lab in collaboration with Culture Lab, both of which are cross-faculty entities. This space, designed for public engagement, will create opportunities for academics, students and partners from either lab to be exposed to what each other are doing. As Lettieri says, "the past informs the future", and this space for exhibitions and events on the past, present and future of cities will enable exploration of London's history, and the site in East London, through ideas and objects.

Ben Campkin, Professor of History and Theory of Architecture and Urbanism, and Co-Director of Urban Lab, is one of the UCL East Academic Leads representing The Bartlett. He says the Urban Room will provide space "to centre and extend forms of publicly engaged, collaborative urbanism that UCL and its partners have increasingly been experimenting with over the past decade".

"THE PHILOSOPHY AT HERE EAST IS A STRONG EXAMPLE OF THE ACADEMIC VISION FOR UCL EAST"

The Urban Room will be one of the UCL East spaces that is most accessible, at the heart of the campus, and an example of how the university is trying open up horizontal conversations, whether they're with local communities, activists, artists or professional groups, with the distinct bodies of knowledge and working

Opposite page from left: Illustration of the UCL East campus in Queen Elizabeth Olympic Park; illustration of the atrium, Pool Street West. Above: Illustration of Marshgate. Images: Glass Canvas.

"THIS IS A COLLABORATIVE ENDEAVOUR, DEVELOPING FRAMEWORKS FOR ENGAGEMENTS AND DIALOGUE WITH URBAN SCHOLARSHIP GLOBALLY"

methods they bring. This is particularly important in the field of urbanism, says Campkin. "Certainly at The Bartlett, there are strong histories of people doing substantive research in East London and, since the 2012 Olympics, there have more and more people from across UCL engaging in partnerships there, as well as practitioners linked to The Bartlett who are based in the area, within the exciting landscape of existing social and cultural infrastructure."

As a strand of activity within the Future Living Institute, the thematic of Global Urbanism is designed to accommodate the research agendas of a range of existing academic entities, such as the Urban Lab and The Bartlett's Institute for Global Prosperity, as well as housing innovative new teaching programmes in areas such as Connected Environments and Architecture and Media. The Urban Lab has two new Master's programmes planned, focused on global urbanism and London. Teaching will be linked to the new Urban Room as well as the other shared and specialist spaces in the Future Living Institute. "Currently Professor Jenny Robinson, Co-Director of UCL Urban Lab, leads activities on 'globalising urbanisms', and this is very much a collaborative endeavour, developing frameworks for engagements and dialogue with urban scholarship globally, across a diversity of urban experiences."

The Future Living Institute will encompass five of the eight UCL faculties, all of which, through their activities, will be looking at how we tackle global challenges from different perspectives, from the planetary scale to the home. Robotics, for example, will sit alongside the Global Disability Innovation Hub. "How do you use technology to enable mobility and independent living?" says Lettieri. The Slade will have a space at the Institute looking at the role of robotics in the making of art, and there will also be a technology hub that revolves around Artificial Intelligence, bringing together The Bartlett Centre for Advanced Spatial Analysis (CASA) and UCL Engineering, to look at the potential for the Internet of Things (IoT). Much of this will connect up the landscapes of the Olympic Park, directly linking with Life Sciences through what's being called 'the internet of wild things'. Lettieri says: "We are building the campus in green space, so we are developing a whole range of programme leads within the Future Living Institute to understand what we can learn from how we use the buildings and how we can nurture and preserve the park itself."

Professor Duncan Wilson at CASA, says the centre's MSc in Connected Environments based at the Future Living Institute will train people up in the technical and applied areas of the internet of things – how data can be collected, visualised and conveyed back to key stakeholders. The park itself will be the testbed, as it has been already for many of CASA's pilot projects in this area. Tales of the Park, in which digitally connected gnomes engaged with passersby, was an early example. "It's about helping us sense and understand the built environment around us," says Wilson.

The notion of a multidisciplinary programme was a natural fit for Wilson, who in parallel to the teaching activity of the course, is also doing hands-on research at UCL East by trying to get as much digital infrastructure as he can designed into the campus and park environment from the start. "There is a vision of this being a smart campus and we're involved in trying to specify exactly what that looks like."

Wilson wants his students to be able to use this digital infrastructure once the buildings open to understand how people are using the park. "From a biodiversity and sustainability perspective, how do we run constant monitoring of the environment?" he asks. CASA has already

"DIVERSITY EQUIPS YOU TO PIONEER AND IT WILL BE ANOTHER STEP IN RECOGNISING HOW DIVERSE A DISCIPLINE ARCHITECTURE IS"

been working with the LLDC on its sustainable smart district project and now UCL will be a part of it: "The nature of the Connected Environments MSc is hands-on learning through doing. In the first two weeks, the Master's cohort are going to build something to measure something, say, plant moisture. They then have to keep that sensor running for the whole year of the course. So that requires students to interact with UCL Estates around how to power the sensor, how to secure it. These are the real challenges for deploying IoT devices. We want to create an environment at UCL East that allows experiments to happen experimentally."

Following Pool Street West a year or so later will be the Marshgate building in 2023. This, Lettieri explains, will be home to the future of manufacturing and advanced propulsion, looking at such grand challenges as how we electrify the transport system, for example. The collaborative MEng between The Bartlett School of Architecture and UCL Engineering, currently running at Here East, will relocate to Marshgate.

The School of Architecture will have studio space on the fourth and first floors, and Bob Sheil, Director, says the new building will strengthen its focus on the intersections between engineering and architecture, technology and place, and policy and economic analysis (The Bartlett School of Construction and Project Management will also have a presence there). It also offers the chance to go back to the drawing board for everyone: "Design comes from evolution and occasionally revolution. Architecture thrives on provocation. Science thrives on having the autonomy to pursue one question. We all ought to be doing something that we've never done before."

Sheil describes Here East, which is a consortium of six departments, as wonderfully exciting but says that Marshgate will be on another level. "A lot of the programmes we're proposing will extend what we're doing at Here East – breaking down silos, drawing closer to engineering, and removing barriers and stereotypes as to what you can do with that research and education. Diversity equips you to pioneer, and it will be another step in recognising how diverse a discipline architecture is."

Sheil is keen that the activities at Marshgate have a complementary mission to Pool Street's Future Living Institute. To that end, he and the UCL East academic leads are exploring whether to create a new forum. He explains: "It would be a collaborative forum for progressive education and advanced research that operates across The Bartlett and other UCL faculties, including Engineering and Arts & Humanities. We will work in partnership to deliver collaborative postgraduate programmes in engineering and architectural design, construction and project management and executive education, targeting building typologies and sectors where innovation is urgently needed."

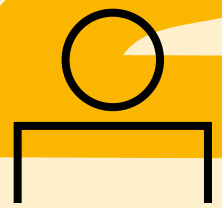
Lettieri echoes the sentiment: "UCL East is all about breaking down barriers that get in the way of tackling pressing global challenges. We've done a lot of talking about it, now we are going to make it happen." ■

Opposite: Illustration of the Nature-Smart Terrace, Pool Street West. Image: Glass Canvas.

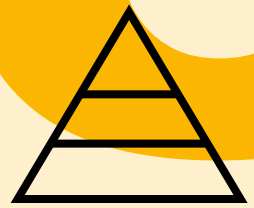
FUTURE FOCUSED

THE BARTLETT'S EXPERTISE ENABLES IT TO ADDRESS IMPORTANT DESIGN, SOCIETAL, AND SPATIAL ISSUES, POSITIONING IT TO MAKE AN IMPORTANT CONTRIBUTION TO RESHAPING THE BUILT ENVIRONMENT FOR A MORE RESILIENT AND JUST FUTURE.

2019



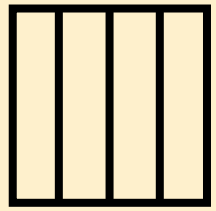
5%
INCREASE IN UNDERGRADUATE AND POSTGRADUATE STUDENTS FROM 3,195 IN 2018 TO 3,360 IN 2019



167
BACHELOR'S DEGREES AWARDED IN 2018/19

1,649
MASTER'S DEGREES AWARDED IN 2018/19

72
RESEARCH DEGREES AWARDED IN 2018/19



16.8%
INCREASE IN RESEARCH FUNDING IN 2018/19 (£15.3M) COMPARED TO 2017/18

NEW PROGRAMMES

2018/19
MArch Biointegrated Design
MSc Biointegrated Design
MA Landscape Architecture
MLA Landscape Architecture
MSc Smart Buildings & Digital Engineering
MSc Energy Systems & Data Analytics

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THE BARTLETT REVIEW 2019

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The Bartlett Review is
produced annually by
Eggcorn: eggcorn.co.uk

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THE COVER
Design by Shift Design

PRINTING
Trade Winds Ltd
Walton-on-Thames, KT12 3PU

Institute for Innovation and Public Purpose

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01 Investor of first resort

Industrial strategy and new forms of patient finance, such as mission-oriented national investment banks, must work together to solve 21st-century challenges.

Governments are increasingly recognising the important role that mission-oriented industrial strategy can play in tackling the key challenges of the 21st century. In the UK, the government's new Industrial Strategy set out four 'Grand Challenges' to position the UK at the forefront of the industries of the future.

The challenge for policy-makers is to move away from a consumption-driven growth model towards a modern investment-led strategy focused on addressing the key challenges of the 21st century, such as environmental breakdown, demographic change, health and education outcomes and inequality.

The return of industrial strategy to the political agenda is welcome. But unless there are new sources of finance established to support it, it is unlikely to succeed. That's because innovation requires not just any type of finance, but long-term, patient, strategic finance.

Short-termism and risk-aversion means that the private sector will often not invest in higher-risk areas until future returns become more certain. Throughout history, many of humanity's boldest advances – from the internet and microchips to biotechnology and nanotechnology – were only made possible by public funding. In each of these areas, the private sector only entered much later, piggybacking on the technological advances made possible by long-term, high-risk public investment.

In these instances, the state has not just sought to fix "market failures" but has acted boldly to create new technological and industrial landscapes by acting as investor of first resort, not simply as lender of last resort. This has taken different institutional forms, but in many countries patient finance is increasingly coming from national investment banks (NIBs).

"A key difference between mission-oriented NIBs and private financial institutions is the breadth of expertise and capacities contained within staff"

Because the governance arrangements of NIBs typically do not create pressure to deliver short-term returns, they can provide patient financing over a longer time horizon, prioritise wider social and environmental objectives, and take a different approach to risk and reward. While the traditional functions of NIBs have been in infrastructure investment and counter-cyclical lending, in recent times they have taken on more active 'venture capital' and 'mission-oriented' roles. In countries such as Germany and China, NIBs have taken centre stage in confronting the key social and environmental challenges of the 21st century, such as climate change.

A key difference between mission-oriented NIBs and private financial institutions is the breadth of expertise and capacities contained within staff. In many cases, this includes not only financial expertise but significant in-house engineering and scientific knowledge about the sectors the bank is active in and the nature of the investments being made. This enables investment decisions to be based on a wider set of criteria than relying on market signals alone, and means they are better placed to appraise social and environmental considerations. In addition to lending operations, many NIBs offer advisory services such as strategic planning, capacity building, and training programs to help to create viable projects and catalyse investments that otherwise would not happen.

Close alignment between state investment banks and government policy, including central bank and other regulatory bodies, can also create a powerful synergy between policy, regulation and financing, which can be co-ordinated for maximum impact. For example, new government policies can be complemented with new financing instruments or financial regulations in order to transmit policy objectives more efficiently. In Germany, this close alignment between the KfW and government policy has been instrumental to the systematic greening of Germany's economy through the Energiewende policy.

If countries around the world are serious about meeting the challenges of the 21st century, then they must also be serious about creating new sources of long-term patient finance. Industrial strategy and new forms of patient finance must go hand in hand.

School of Construction and Project Management

Jacqui Glass is Principal Investigator of the Transforming Construction Network Plus, Professor in Construction Management at The Bartlett School of Construction and Project Management and Vice Dean Research at The Bartlett. @profjacquiglass

02 Tipping point

Transforming the way research is done in construction will open up new possibilities to disrupt a sector that is in urgent need of change.

Building better, building faster, building safer – these are the goals for the UK construction industry over the next few years. If we are to deliver high-value buildings, we desperately need to improve productivity, quality, and performance. The mood music from policy-makers certainly indicates that off-site methods are once again the 'go-to' technology, and we have a once-in-a-lifetime digital opportunity to make all this come to life. The bad news is that we need to accelerate the programme to reduce building carbon emissions and avert a climate catastrophe.

With this in mind, the UK government launched the Transforming Construction Challenge, as part of the Construction Sector Deal. The challenge is looking to industry and researchers to innovate in construction, increase productivity across the UK, and open up significant global markets for a rejuvenated body of building expertise. There's no debate – this will be a truly arduous shift for this fractured, combative and yet resilient and highly creative industry. Change is always a challenge, not least within construction. Whereas other sectors have undergone tremendous change over recent decades, the way that we create buildings has not really changed in the past 40 years or more.

This kind of challenge simply cannot be overcome without a global movement and sustained efforts from a diverse group of actors. As part of the Transforming Construction Challenge, the Transforming Construction Network Plus (N+) is uniting academic and industrial communities to create a new research and knowledge base, dedicated to address the systemic problems holding back the sector. Since November 2018, the N+ has been working with people across construction and beyond, aiming to create a movement to explore new perspectives, ideas, and collaborations.

"There's no debate – this will be a truly arduous shift for this fractured, combative and yet resilient and highly creative industry"

Committed to the role that interdisciplinarity will play in this, the N+ brings together people across the digital, energy, construction, and manufacturing space. It is organising events which offer carefully curated opportunities to learn from others. From academic to industry representatives, the attendees experience cutting-edge research and have the chance to re-imagine how their own expertise could contribute to the Transforming Construction agenda.

Facilitating new collaborations, the N+ provides funding for research projects which unites academics from different universities to bring the best knowledge to the rest of the programme and maximise exposure across industry. The funding calls encourage the community to take a novel perspective and to explore methods and theories from a wide range of disciplines. This is also a tough gig for the construction academic community – scholarly work in construction management tends to lag behind its peers in engineering and management disciplines in the same way that its own industry domain lags behind manufacturing and ICT. That is why, as part of the N+ core activities, companies' responses to the Construction Sector Deal, and the stimulus of the Transforming Construction Challenge are a focus for research.

With construction tsars targeting a 2.4% investment in R&D from the sector, the N+ is campaigning for a refreshed, positive mindset. And experience shows that the N+ is opening a door to the world. Offering international webinars and disruptive conferences with guest industry and academic speakers from as far away as Hong Kong and San Francisco, the N+ explores innovative perspectives, and how they could deliver a 'tipping point' in the sector.

Together, we reflect every day on our experience to shape a network which will answer the needs of the industry and its actors and stakeholders. Moving towards a new way to think and to create, the N+ aims to open the possibilities and change the ways in which we do research in construction. Changing the way that we build necessitates changing the way that we think.

Institute for Sustainable Heritage

Dr Kalliopi Fouseki is Associate Professor in Sustainable Heritage at the UCL Institute for Sustainable Heritage.

03 Green by design

“Heritage is much broader than buildings, objects or sites. It is about ‘anything’ that people can culturally and socially identify with and which they wish to transmit to future generations”

Heritage can play an active role in sustainable development contributions to the majority, if not all, of the UN Sustainable Development Goals.

In 2015, the United Nations adopted 17 Sustainable Development Goals (SDGs) that signed-up countries need to act upon. The cross-cutting message of the SDGs is that if they are met, prosperity for all will be achieved, while protecting the planet. One might wonder where heritage fits within this globally challenging context and within the current discourses and endeavours for sustainable development.

Interestingly, it does. Target 11.4 in Goal 11 on ‘Sustainable Cities and Communities’ states that it aims to “strengthen efforts to protect and safeguard the world’s cultural and natural heritage”. When you consider that the former Millennium Development Goals made no such reference to heritage, and only in part addressed the need to protect biodiversity and natural resources, this explicit reference to it in the SDGs is a great advancement for all of us working in and for heritage. However, as urgent as the need to protect cultural and natural heritage is, it is also risky to limit the scope of heritage in this way. Heritage can have a more active role in sustainable development and can contribute to the majority, if not all, of SDGs.

By protecting and promoting heritage for all, cities can feel safer, wellbeing can be increased, new jobs and growth can emerge and environmental sustainable practices can be encouraged. This is because heritage is, as UNESCO says, green by design: heritage “embodies an intrinsically more sustainable pattern of land use, consumption and production, developed over centuries if not millennia of slow adaptation between the communities and their environment”.

For heritage to contribute to the SDGs, it is essential that local communities are active agents in the sustainable transformation process of their area. As a matter of fact, the link between heritage and sustainable development is not new. Over the past few decades, there have been intensive initiatives to revitalise abandoned historic areas through, mainly, the conservation and adaptive reuse of derelict historic buildings. These initiatives have led to positive outcomes related to economic growth and poverty reduction. However, these outcomes either did not last for long or did not prove resilient enough to economic and social, global crises. Meanwhile, other unintended (or intended) negative social consequences, such as the dislocation of communities as a result of gentrification and high property prices and the lack of interaction between ‘new’ and ‘old’ communities, can be observed.

These observations led the UCL Institute for Sustainable Heritage to organise a workshop in March 2019, supported by the UCL Urban Lab and the Centre for Critical Heritage Studies, that brought together policy-makers from local authorities, national heritage agencies (such as Historic England) and international organisations (such as UNESCO, ICCROM and ICOMOS). The aim was to nail down the different ways in which heritage can contribute to the SDGs agenda and the methods we need to employ in order to evidence this contribution. We agreed that heritage is much broader than buildings, objects or sites. It is above all about ‘anything’ and ‘everything’ that people can culturally and socially identify with and which they wish to transmit to future generations. If heritage is understood in this way, then it can certainly be a catalyst for the achievement of many of the SDGs.

The way forward is now for heritage researchers, practitioners and policy-makers to synergise with other sectors in order to systematically document and evidence the progression of SDGs for which heritage should be an integral component.

Professor Yolande Barnes is Chair of The Bartlett Real Estate Institute. @Yolande_Barnes

04 The fifth age of cities

As global investors look for long-term income streams, their interests will become increasingly aligned with community interests and environmental pressures.

Disruption is the buzzword of the 21st century. Here at The Bartlett Real Estate Institute we've identified social, economic, environmental and digital changes that will significantly alter the face of real estate. Taken together, these disruptors mark a new age for cities. But, despite the fifth age being a product of the 21st century, some elements of the most successful cities will look more like the first age than the fourth. At a time when human beings have access to anything anywhere through electronic devices, it will be proximity to, and interaction with, other people that matters most. The scale and quality of human interactions will determine a city's success.

This first age of cities was pre-industrial or agrarian. For centuries, indeed millennia, cities were characterised by human interactions. They developed as gathering places on routes such as rivers and tracks, and not where the routes ended, but where they intersected. The building blocks of cities are therefore not just buildings, which come and go, but streets, embedded in and of the landscape.

The second age of cities was the result of industrialisation which changed these ancient settlement patterns. The new industrial cities were located not where people met, but where they worked, in proximity to raw materials. Cities no longer formed at crossroads, but around manufacturing. An urban working class emerged, land uses became separated and the newly wealthy industrialists escaped the noise and pollution of the cities by building country estates.

Closely linked to the second, industrial age was the third: the age of the mercantile city where proximity to markets was all-important. Cities became import, export and consumption centres for the newly manufactured goods of the second age. This is the era when cities became extensive, and even sprawling, and inner cities depopulated as the newly affluent middle classes aspired to suburban lifestyles, and suburbanisation was aided by public transport and private car ownership.

"Capital growth will be a product of rental growth, which is dependent on servicing occupiers' wants and needs rather than trading land"

The fourth age was the age of capital, when financial power, created by industry in the second age and trading in the third, became concentrated in certain locations. The financial city is about proximity to financial capital. Cities became centres of banking and financial services. Land use was orientated around these services and those associated with them, such as law, real estate and consultancy. In a post-industrial age, the wealthy were once again attracted to good city neighbourhoods in an 'urban renaissance'.

Money was also a major influence on planning and the built environment in the late 20th century fourth age. The big investing institution's job was to deploy capital for growth. That coincided with modernism and skyscrapers and massive buildings, which suited these investors, and the planning system adapted to allow these large single-use concentrations of capital, through zoning and/or planning use classes. The way our cities were built and the way they looked and performed was geared around this capital deployment. It may have suited investment institutions but it hasn't necessarily provided people-friendly neighbourhoods or the most environmentally-sustainable places.

In the 21st century, global investors are looking for long-term income streams (to pay pensions) rather than capital returns (to grow funds). A low-interest rate, low-inflation environment means that large capital gains will not be automatic. Land and property prices cannot grow without growth in what they produce. Capital growth will therefore be a product of rental growth, which is dependent on servicing occupiers' wants and needs rather than trading land. Investor interests are becoming increasingly aligned with community interests and environmental pressures, as these go hand-in-hand with longer-term economic sustainability. Digital technology has the potential to facilitate the creation and management of the built environment for all these outcomes.

In a world where so much happens online and digitally, where working and social life can be dictated by algorithms, real-world experiences take on an enhanced value. People are increasingly valuing the authentic experiences and serendipitous meetings that are only available in real places and spaces. Once again, it is the quality of human interaction and juxtapositions happening in cities which have value. Street networks and the cultural life of the city have always mattered but, in the fifth age of cities, they will translate into economic, as well as social and environmental value.

Institute for Sustainable Resources

Dr Julia Tomei is Lecturer in Energy, Resources and Development at the UCL Institute for Sustainable Resources. @juliatomei1

05 The last mile in energy access

There are lessons to be learned from Colombia's approach to providing electricity for people living in off-grid areas of the country.

The provision of access to modern energy services for all is a key global challenge and has been recognised in the UN's 2030 Agenda for Sustainable Development. Sustainable Development Goal (SDG) 7 aims to ensure access to affordable, reliable, sustainable and modern energy for all by 2030. Worldwide, there are an estimated one billion people who lack access to electricity, while a further billion people have only intermittent access – meaning that supply is unreliable or limited.

To date, Latin America has done well to address this challenge and has access rates of 95%. Nonetheless, an estimated 26 million people still lack access to electricity across the continent. Delivering electricity to this last mile in energy access is difficult, because it involves reaching people who live in isolated and often impoverished rural communities. Complicating the picture further is that electricity demand is typically very low in such 'last mile' communities, which makes it difficult to attract private-sector investment.

Colombia has made substantial inroads into delivering electricity to its population and in 2017 had an electrification rate of 98%. However, digging into this number a little deeper reveals that while 100% of households living in urban areas are electrified, this falls to 87% in rural areas. This means that 1.4 million people remain without access to electricity – most of whom live on the Pacific Coast, in La Guajira and the Amazon. These 'forgotten areas' not only lack access to electricity, but access to many other basic services such as drinking water, sanitation and health. These areas also tend to be those that were most affected by Colombia's 50-year conflict and, while peace has brought new opportunities, it has also led to new challenges – including increased human rights violations as various armed groups move into areas vacated by the FARC, and rising deforestation.

"The benefits of electrification cannot be assumed, particularly where programmes to provide access have a narrow focus on the delivery of energy infrastructure alone"

Since 2016, I have been working with local universities to investigate last-mile electrification in Colombia. Through our research we aim to understand the challenges, the solutions and the impacts of electrification for people living in off-grid areas of the country. We've shown that electrification brings multiple benefits – providing not only lighting, refrigeration and entertainment services for households, but also opportunities for income generation, such as cold storage for agricultural and fishing products. However, such opportunities are constrained by poor infrastructure, low capacity and limited resources.

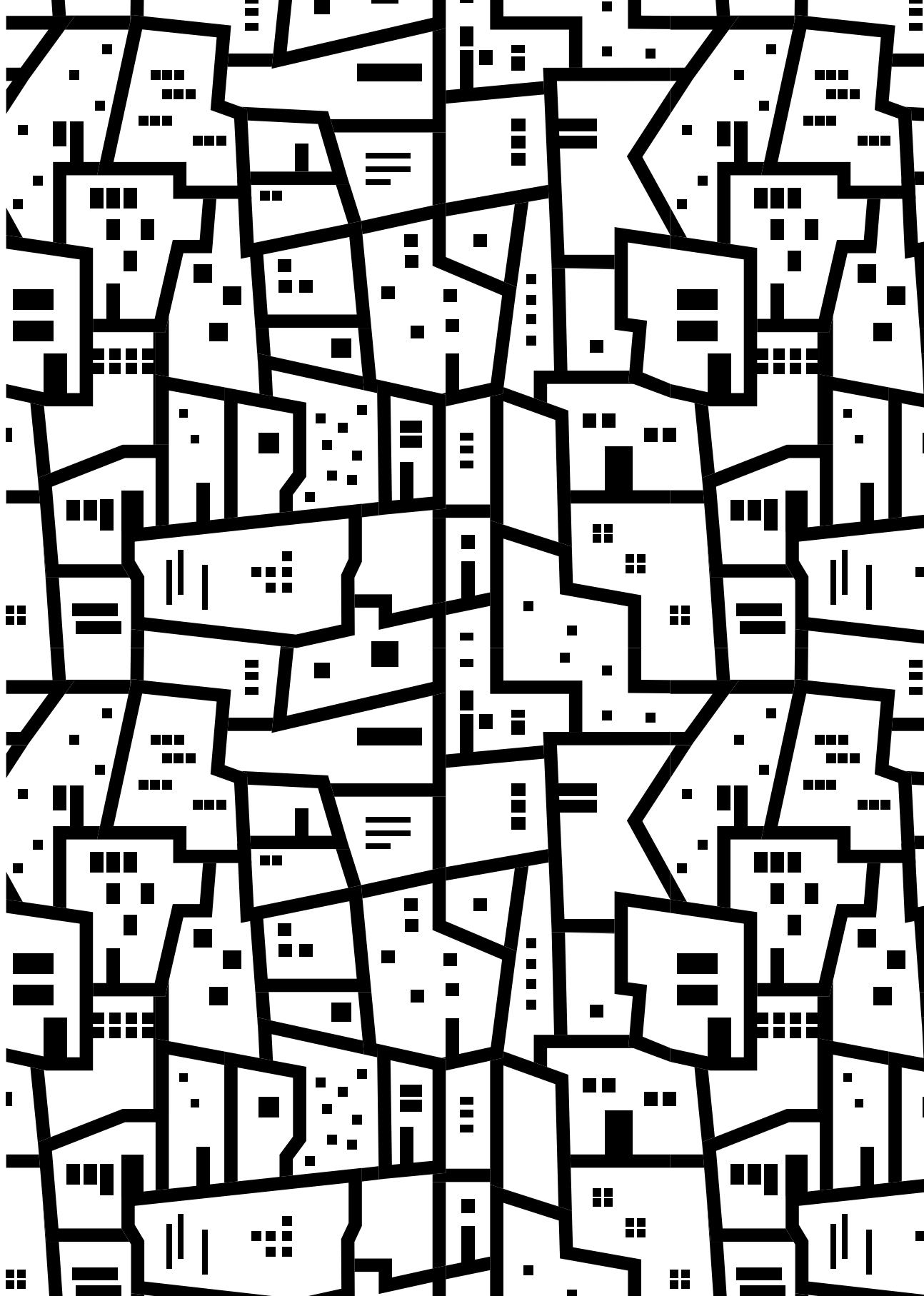
Our research has shown that the benefits of electrification cannot be assumed, particularly where programmes to provide access have a narrow focus on the delivery of energy infrastructure alone. Rather, if electricity is to provide the multiple development benefits on offer, it should be delivered as part of wider development programmes that place community needs at the centre.

We're also interested in understanding how clean energy solutions, such as solar and wind, can meet off-grid energy needs. Most off-grid electricity in Colombia is provided by diesel-powered generators. The use of diesel is not only costly for the state (due to subsidies), but also contaminates local environments and contributes to climate change. Our research has shown that renewable energy technologies are cost-competitive with diesel, but that their roll-out is hampered by outdated regulation and the structure of energy markets. Here, Colombia has much to learn from experiences in Africa, where enabling policy environments have created opportunities for the private sector to deploy renewable off-grid energy, particularly solar. This provides exciting opportunities for knowledge sharing, with learnings from elsewhere being adapted and applied to the Colombian context.

Reaching full electrification in Colombia is within sight. However, delivering energy access requires finding solutions that meet people's needs without damaging local and global environments. Our research is providing vital evidence that such solutions exist and with that a means to contribute to sustainable development in Colombia.

“Co-designing infrastructure starts with the city as it is, and finds pathways for citizens, professions, governments and industry to work together towards more sustainable, liveable futures”

Professor Sarah Bell,
Director, The Engineering Exchange



Institute for Environmental Design and Engineering

Sarah Bell is Professor of Environmental Engineering at the UCL Institute for Environmental Design and Engineering and Director of The Engineering Exchange. @sarahjaynebell

06 Designing Together

Co-design methods are well established in service and product design, but have rarely been applied to infrastructure. That needs to change – fast.

Nikki is designing a rainwater harvesting system for her housing estate in London. Until a few months ago, she didn't give water much thought. Her only decisions about water had been around her family laundry and bath routines. Now she's working with her neighbours to calculate how many tanks they need to irrigate their garden and wash their cars, and how much water this will keep out of London's sewers. Keeping water out of the sewers helps prevent pollution of the Thames. Collecting water locally will help avoid water scarcity, which is a growing threat in London. Nikki is not an engineer, nor is she a plumber. She has never been asked what she thinks about the future of water in London. As the challenges of water, climate change and other environmental problems grow, Londoners like Nikki, and urban citizens around the world, will be ever more important in bringing about sustainable change.

Conventional design and management of infrastructure for cities has divided attention between supply and demand. Engineers and experts designed systems of supply, individuals like Nikki drove demand. Decentralised supply has become an important element of sustainable infrastructure, as have technologies to improve resource efficiency. The lines between supply and demand have become blurred. Citizens and local communities can meet some or all of their own demand, and even become suppliers for water, energy, food and transport. The relationship between supply and demand, and the role of technology and infrastructure is ever more complex. Nikki and her neighbours are vital elements of dynamic urban infrastructure systems, and yet they are rarely involved in decisions about them.

Design is usually something that is done for or to Nikki. The EPSRC-funded Engineering Comes Home project aimed to design infrastructure with Nikki and her neighbours, following the principles of community-based co-design. Co-design methods are well established in service and product design, but have rarely been applied to infrastructure. As part of the project, a series of workshops brought together residents, engineers and designers to design infrastructure from the bottom up. New software tools put powerful engineering analysis techniques, such as lifecycle assessment, into the hands of novice co-designers. The project raised residents' knowledge of the infrastructures that serve them, and incorporated their expertise and values into engineering system design.

"Decentralised supply has become an important element of sustainable infrastructure, as have technologies to improve resource efficiency. The lines between supply and demand have become blurred"

Building on Engineering Comes Home, researchers from across The Bartlett have used similar methods to work with the Somers Town Neighbourhood Forum to develop local plans to improve air quality, funded by the EPSRC Impact Acceleration Account. These methods are a central element of the NERC-funded Community Water Management for a Liveable London, a collaboration between The Bartlett, Imperial College, the University of Oxford and the British Geological Survey.

The complexity and scale of resource and environmental problems facing cities is overwhelming. Designing infrastructure, buildings and technologies to reduce demand for resources and to prevent pollution is vital. Engaging citizens and communities is also essential. Co-design brings them together. The process requires investment of time and adaptation to local circumstances. It draws on diverse expertise, recognising the importance of living knowledge, grounded in communities. Science, engineering and design retain their strength as particular ways of knowing and intervening in the city, and are reframed in direct service of local communities. Achieving the level of change needed to have an impact on such enormous problems requires replication of grassroots action across the city, as well as scaling-up new approaches to collaboration. Co-designing infrastructure starts with the city as it is, and finds pathways for citizens, professions, governments and industry to work together towards more sustainable, liveable futures.

Andrea Rigon and Alexandre Apsan Frediani are Associate Professors at The Bartlett Development Planning Unit and co-founders of the Sierra Leone Urban Research Centre (SLURC). @rigonandre @xapsan

07 Transforming informal settlements

Academic international partnerships can play a role in responding to power imbalances among higher-education institutions, while addressing the challenges of sustainable development.

UCL's Vice-Provost International and Pro Vice-Provost for Africa are in Sierra Leone to witness the impact of academic activities at a conference of the Sierra Leone Urban Research Centre (SLURC): a unique partnership of academics from Sierra Leone's Njala University and The Bartlett's Development Planning Unit (DPU). A young woman opens the conference with a poem about her experience fleeing the war as a child and facing another struggle growing up in the informal settlements of Freetown. The audience is moved, the newly elected mayor spontaneously moves to the stage and they hug each other. This empathic hug between these two women is a good representation of the work of the SLURC in brokering relationships between different parts of society that weren't speaking to each other.

When the SLURC began its activities at the end of the Ebola crisis in 2015, the predominant government discourse towards the residents of informal settlements was one of criminalisation and eviction. Through research, capacity building and advocacy, it has changed this discourse and created a platform for constructive engagement in order to achieve its objective of improving the wellbeing of the residents of Freetown's informal settlements.

It's hard to overstate the scale of the challenges in Sierra Leone, which ranks 179th out of 188 on the UN Human Development Index, and has the highest maternal mortality rate in the world. Civil war from 1991 to 2002 displaced a third of the population and its fragile post-war recovery was undermined in 2014 by the Ebola epidemic, which killed about 4,000 people and slowed the economy. Freetown is home to around one-seventh of the Sierra Leonean population and is still shaken by the memory of catastrophic landslides in 2017, which killed 1,141 people, destroying homes built in unregulated settlements on mountainside land known to be at risk.

"SLURC has become a broker of relationships between communities and government actors at different scales to identify shared solutions supported by research evidence"

In this context, SLURC's focus has been to create an academic urban research centre that benefits from and facilitates international networks, while acting as a local institution where Sierra Leonean grassroots organisations shape the research agenda, rather than operating as a satellite of an overseas university. Started with funds from Comic Relief and academic input from The Bartlett Development Planning Unit, SLURC is based at the Institute of Geography and Development Studies at Njala University. What makes it unique is the way it has become a broker of relationships between communities and government actors at different scales to identify shared solutions supported by research evidence.

SLURC has brought together existing urban knowledge into a database and made it available to everyone. It has developed capacity-building programmes training hundreds of urban practitioners in Sierra Leone as well as creating an online course on development and planning in African Cities, with over 2,500 participants worldwide. It has also worked to develop a network of Freetown change-makers, by organising learning exchanges with other African cities and helping communities to draft their own development plans.

The success of the SLURC approach has been to develop 'partnership with equivalence' between UCL and Njala University staff; to activate synergies between embedded and local relationships, as well as international networks; to facilitate reciprocal learning and capacity building; and to effect change at the local level in Freetown, while creating opportunities for SLURC to participate in and inform international debates on urban development and planning.

To date, more than 25 UCL academics and 100 UCL postgraduate students have travelled to Sierra Leone to work with SLURC on urban livelihoods, the city economy, urban mobility, land and housing, urban health, and urban vulnerabilities and resilience. This experience shows that with long term commitment and sensitivity, academic international partnerships can play a role in responding to the international power imbalances among higher education institutions, while addressing the challenges of sustainable development.

School of Construction and Project Management

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08 Fit for the future

Tackling the UK government's four Grand Challenges requires governance structures able to cope with uncertainty over the next three decades.

It's been two years since the UK's Industrial Strategy set out four Grand Challenges: artificial intelligence and data, ageing society, clean growth and the future of mobility. During the first half of 2019, I was seconded to the Grand Challenges team, but it is only recently that I noticed the small print on the cover of the strategy white paper – under the main title it states: "Building a Britain fit for the future". Those who have expertise in design and construction contracts will be alarmed by the word "fit". Consultants and contractors are likely to step away from projects, independent of size, if the contract includes this clause, whether it's a 117-kilometre South-east railway line (Crossrail) or a low-cost rural footbridge in Hull.

Contractors would usually agree to deliver a "fit for purpose" engineering project, by meeting the employer's demands and design specifications. But a legal obligation to deliver a project that is fit for purpose when completed is a tough commitment. How can the government deliver such an ambitious plan? What governance structures need to be in place to address the Grand Challenges? Given the 30-year-plus year span of the strategy, how will these processes evolve and be optimised to remain fit for the future?

The Grand Challenges programme has developed and grown across government over the past two years and new layers of governance are evolving. To ensure they are optimised for programme delivery, I spent six months working with the team to evaluate where improvements could be made to ensure programme governance is used effectively to streamline and support decision-making.

Recent research suggests that, to successfully deliver policies to meet the Grand Challenges, new governance structures within the public sector are needed. A report by the UCL Institute for Innovation and Public Purpose (IIPP) emphasises that these governance forms should enable cross-sectoral and cross-institutional co-ordination. Over a 30-year-plus timeline, it is unlikely that the government structure will remain unchanged. That is why a certain degree of flexibility and adaptability is required.

"When designing such ambitious policy programmes and goals, we need to acknowledge exogenous uncertainty and embrace flexibility"

Academic literature asserts that where technological and market uncertainty is very high, organisations are better off adopting governance forms that are reversible and involve a low level of commitment. When uncertainty has decreased, then organisations can shift towards governance forms that are less reversible and more hierarchical.

It is this approach that the team took to support delivery of the Grand Challenges across government. Having a central team based in the Department for Business Energy and Industrial Strategy in the role of asset orchestrator, set the pace for these developments. This role involves identifying the critical assets and investing in them, and then developing a governance form along with a means for their effective use. The team displayed astute decision-making and entrepreneurial capacity by optimising the configuration of the governance forms of the Grand Challenges programme.

The team first initiated discussions within its own department and with cross-governmental departments to identify efficiencies regarding strategic implementation. This resulted in reconfiguration of the existing governance around decision type, instead of hierarchical formation to reach the appropriate actors, such as the Cabinet Office. It then redefined the remit, roles and decision-making abilities of stakeholder boards involved in the programme. It also streamlined interactions with other Industrial Strategy structures internally to enable the possibility for resolution on strategic matters. It established a clear process to engage and seek expertise from non-programme stakeholders, such as UKRI and the Industrial Strategy Council. Finally, it created a Grand Challenges board to provide strategic direction on cross-cutting issues across government. The board would decide how and when to escalate strategic matters through the governance structure, and to oversee the progress of the programme. Ultimately, this governance structure intertwines cross-sectoral and cross-institutional co-ordination effectuating systemic innovation.

When designing such ambitious policy programmes and goals, we need to acknowledge exogenous uncertainty and embrace flexibility. This grants a trade-off between efficiency and effectiveness, yet is necessary for future-proofing and ensuring policy development copes with change of strategic direction. From the outset, the Grand Challenges team shifted away from traditional management functions such as control, supervision, and administration. Instead, the Grand Challenges programme can sustain trade-offs such as flexibility, entrepreneurship, adjustment and adaptation by implementing new combinations and co-alignment of assets. By doing so, it will be able to cope with uncertainty and change and deliver its mission, even if the Grand Challenges alter or evolve in the future.

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Self-build housing programme community dinner in Nakhon Sawan, Thailand. Photographed for KNOW by David Heymann (2019).

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4 YEARS
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