INTRODUCTION

SUMMARY

The Engineering Exchange (EngEx) began work in March 2014, with funding from the UCL EPSRC Impact Acceleration Account, UCL Engineering and an Ingenious Award from the Royal Academy of Engineering. The EngEx officially launched in October 2014, with a public round table and launch of the report ‘Demolition or Refurbishment of Social Housing? A review of the evidence’, which was commissioned by the London Tenants Federation and the Just Space Network.

Since the launch, the EngEx has continued to foster new projects in collaboration with London-based community groups, develop continuing professional development (CPD) training programmes for engineers and offer public events as part of its aim to establish UCL as a world-leading centre for community engaged engineering research, teaching and entrepreneurship.

The EngEx believes that community engagement is a two-way process, with communities benefiting from access to leading-edge research outcomes and researchers and students benefiting from community knowledge and problem identification. This forms the foundation of all work undertaken. This report outlines the aims, projects, training and budget of the EngEx to date, as well as our plans moving forward.

KEY AIMS

Research – aligning engineering research with community needs. The EngEx supports researchers in developing community based research projects and in working with communities to turn a specific need for technical knowledge into an appropriate research question and project. The EngEx supports researchers to incorporate upstream public engagement in their projects to better address the need for responsible, responsive research and innovation.

Skills – providing communities with access to engineering skills and knowledge. The EngEx provides a brokering service to match specific community needs for technical expertise with staff and students in UCL Engineering. For instance, communities may have needs for environmental monitoring, mapping or support in developing local sustainability plans.

Learning – integrating community knowledge and needs into engineering curricula and continuing professional development (CPD). The EngEx works with the Integrated Engineering Programme and various Engineering MSc programmes to identify opportunities to embed community based projects into the curriculum, and to provide students with the necessary skills and knowledge to undertake community based projects throughout their professional careers. Our CPD course ‘Engineering with Communities’ supports development of skills and capabilities in community engagement for practicing engineers and engineering researchers.
The Engineering Exchange develops and delivers research projects which are cultivated through partnerships with community groups. Partner networks including Just Space, the London Sustainability Exchange (LSx) and the London Tenants’ Federation (LTF) help by notifying their members of opportunities, and community groups can approach the EngEx with ideas, questions or problems.

When a project is suggested, the EngEx identifies the relevant expertise, skills and interest from its register of engineers and ‘match-makes’ the parties. Project outputs, timelines and potential follow-on work is then agreed between the project participants. Although there are no restrictions on the length of time, subject or activity resulting from the projects, they must address a specific, technical problem faced by a London community and be delivered in partnership between UCL engineers and members of community groups located or operating in London. They must also fit within the schedules and time commitment ability of both the engineers and the community groups.

Projects are considered successfully completed when the objectives are met and stakeholders have held a final meeting to offer feedback and ‘close out’. The following projects are either completed or in progress:

**DEMOLITION OR REFURBISHMENT OF SOCIAL HOUSING?**

The first project overseen by the Engineering Exchange was completed in partnership with Just Space and the London Tenants Federation. The report, written by UCL based researchers and released at the EngEx launch event, compiled evidence for demolition or refurbishment of social housing in London. In addition to the report, a series of fact-sheets, videos and a policy briefing are available on the EngEx website. The initial project was followed by development of a toolkit to help residents evaluate decision-making processes.

**OLD OAK COMMON**

The EngEx and UCL’s Transport Institute undertook a planning Charrette in December 2015 with LTF, Just Space and the Grand Union Alliance (GUA), a community network responding to development planning in Old Oak and Park Royal. JTP Architects were hired to facilitate the day, which aimed to provide members of the GUA with the skills to respond to the Local Plan consultation for the area. The Independent Transport Commission exemplified the approach utilised in the charrette as effective community engagement. The resulting strategy for community participation in the regeneration process is available on the EngEx website.
BARGING AROUND LONDON

With the Regents Network and Just Space, ‘Barging’ aimed to contribute to the restoration of London’s canals and waterways as transport channels, thereby enabling improved air quality and more efficient freight systems. Overseen by Giles Thomas, Professor of Maritime Engineering, MSc student Henrik Utvik in UCL’s Department of Mechanical Engineering provided a technical analysis of design requirements, cost and feasibility for a new autonomous barge design.

CARPENTERS’ ESTATE INFRASTRUCTURE PLAN

Redevelopment that proposes widespread demolition has been outlined for the Carpenter’s Estate in Stratford. The Estate’s residents and businesses wish to put forward a viable refurbishment-led alternative, with a Community Plan reflecting this is already in place and a community-led Neighbourhood Plan due in late 2016. During the project, undertaken between September 2015 and March 2016, students on the MSc Environmental Systems Engineering worked with residents through an ‘optioneering’ process to develop plans for water and energy infrastructure on the estate, and to input into the developing designs. The resulting outputs were household and site-wide short, medium and long-term water and energy infrastructure strategies that considered technical feasibility, cost, sustainability and residents’ aspirations.

TRANSPORT CITIZENS’ JURY

In collaboration with the UCL Transport Institute the EngEx hosted a Citizen’s Jury in February 2015 to inform priorities for transport research in the UK. The Citizen’s Jury involved 12 members of the public, chosen to represent a cross-section of the public, who were able to ask questions of transport researchers, policy makers, activists and engineers. The outcome was a list of citizen-based priorities for transport research, emphasising local transport planning. The findings were reported to the Department for Transport and the Engineering and Physical Sciences Research Council, to inform future research priorities.

WARD’S CORNER PLANNING EVALUATION

The West Green Road and Seven Sisters Development Trust prepared a proposal for the development of Wards Corner above Seven Sisters tube station. To satisfy safety and viability requirements, UCL engineers provided technical support and guidance including interpretation of technical reports and information gathering. They also accompanied the group to a meeting with TfL to discuss technical issues related to the structural and geotechnical safety of the proposal, and to debrief the Trust after the meeting to identify priorities for future action.
COMMUNITY SMART METERS

In collaboration with Millbank Estate and Ben Hudson of the London Sustainability Exchange, this project will test a community-based approach to smart meter take-up, deploying second generation smart meters in an inner-city housing estate through a community engagement process led by community ‘champions’. UCL engineers will offer technical support on smart metering technologies.

CROSSWALK IMPROVEMENT

Together with Wandsworth Living Streets, Dr Tom Cohen is evaluating options for improving the efficiency, accessibility and safety of crosswalks in London. The project will present various modelling scenarios to Transport for London, to gauge support for a more extensive study.

OLD STREET ROUNDABOUT AIR QUALITY

Prof Muki Haklay, together with Cargobike Life, is evaluating the potential for a project that provides data relating to the feasibility of consolidating business deliveries in the Old Street roundabout area, with a view to reducing air pollution. The project will first survey local businesses, then potentially move on to a wider scope of evaluating consolidation and traffic flow options.

OXYPOD ENERGY SAVING TECHNOLOGY

As winner of the audience choice funding award for the ‘Health, Ageing and Well-being’ forum, this project is bringing together Dr David Selviah and Nafiseh Vahabi from Electronic and Electrical Engineering with members of the Goodwin Development Trust to support development and testing of the Oxypod de-aerator for water heating systems. The technology aims to reduce energy bills and service requirements for residential use.

WEST EUSTON PARTNERSHIP AIR QUALITY MONITORING

Prof Muki Haklay, together with the West Euston Partnership, is designing a project to monitor air quality around the Regent’s Park Estate, using a citizen science approach. The project will include the ‘skilling up’ of residents in the form of support in performing a literature review, followed by design support for a community-led air quality monitoring process.

‘A good solid piece of work with a run-through and very clear and concrete evidence of results.’

Project partner, Demolition or Refurbishment
In June 2015, the EngEx hosted the third annual Integrated Network for Social Sustainability (INSS) conference, organised by the University of North Carolina at Charlotte. The conference, bringing together 12 participants from across the UK, comprised site visits to Crossrail and Social Life, paper presentations and cross-site simulcast sessions including keynote speaker Adjo A. Amekudzi-Kennedy from the School of Civil and Environmental Engineering at Georgia Tech, looking at holistic capital management for human-centred wealth.

In June 2016 we again hosted the London site for the conference, with a scaled-up programme and more than twice the number of attendees. With the theme ‘Communities and Connections’, the two-day conference involved talks and events simulcast with 7 sites across the United States. The programme included a roundtable on ‘Community Engagement with Sustainable Drainage’ with speakers from Groundwork, Just Space, KLH Sustainability and Tideway; a workshop on the water, energy, food and faith nexus with presentations from Thames Water, Groundwork and the London Sustainability Exchange; a cross-site panel on ‘Invisible Disasters’; digital poster presentations and a showcase of a range of EngEx projects.

The conference keynote speech was delivered by Dr Timothy Beatley, Teresa Heinz Professor of Sustainable Communities at the School of Architecture, University of Virginia. There was also a stand-alone panel discussion on the theme ‘Sustainability and Human Security’ with Dr Des Gasper of Erasmus University Rotterdam, the Deputy Leader of Green Party UK Amelia Womack and Irene Guijt from Oxfam and chaired by Michael Drinkwater of WayFair Associates.
COMMUNITY RESEARCH FORUMS

The Engineering Exchange held a series of community research forums at UCL with the London Sustainability Exchange, in order to inspire new ideas for collaborative projects. The forums brought together researchers and academics from UCL, LSE, SOAS, KCL, UEL and LSBU with community groups and members of local councils working on a range of issues. Events comprised an introduction to the challenge and possible solutions, brainstorming sessions and focus groups on specific topics, and peer review project pitching and voting. Winning projects from each event were awarded funding and EngEx support.

TRANSPORT, POLLUTION AND BIG DATA

London’s transport system is highly efficient, but extremely congested. Partially as a result, London suffers the effects of poor air quality leading to more than 9,000 premature deaths per year1. The first forum event was held in the Main Quad Marquee at UCL in October 2015 and brought together community groups engaged in issues around local sustainability, transport, air quality and regeneration, with academics and researchers who have access to data sets and expertise in data analysis and visualisation, as well as domain specialists in transport and pollution.

HEALTH, AGEING AND WELL-BEING

The projected 46% rise in over-65s and the doubling of the over-90s age group by 2029 will put great stress on the NHS2. End of life care is likely to suffer as mobility and housing issues reach crisis point. The second forum took place in UCL’s Wilkins Garden Room in February 2016. It brought together community groups interested in combating ill effects of insufficient health care for an ageing population with academics and researchers with expertise in biomedical engineering, healthcare engineering technology, mobility, sensors, assisted living and accessibility.

SMART, SUSTAINABLE LONDON

The third event in the series was held in UCL’s Main Quad Marquee in February 2016. It brought together researchers and community groups engaged with energy and water efficiency; smart meters; using data in planning and decision-making; sustainable transport; the circular economy; community gardens and related issues to look into innovative technological developments aimed at developing a more sustainable city. In addition, the event aimed to reinforce decision-making and encourage increased energy and water efficiency.


‘Best thing about the event? Getting my project to actually happen. I’ve gained contacts and support to enable this.’
Forum attendee
Participants in our community research forum on the topic ‘Smart, Sustainable London’ discuss new ideas and actions for building a sustainable city.

Ben Hudson, from co-organiser the London Sustainability Exchange, takes notes during our community research forum on the topic ‘Transport, Pollution and Big Data’
CONTINUING PROFESSIONAL DEVELOPMENT

OVERVIEW

The EngEx developed a one-day training session called ‘Working with Communities: Practical Skills for Engineers’ which provides an introduction to useful skills and approaches when working with communities. The training offers case studies from community-based organisations, as well as skills sessions and opportunities to develop learners’ own project ideas. The training was piloted in May 2015, with attendees across UCL’s Faculty of Engineering providing feedback on their experience. The training was then developed further and offered externally, with attendees from UCL and Arup.

The training is now ready to be tailored to specific groups of learners, with a series of ‘module’ case studies that can be selected based on a survey of participants’ interests. It is also possible for industry organisations to contract a training session for their employees.

TEACHING TEAM

The teaching team for each delivery depends on the interests of the cohort, and is comprised of UCL staff, engineers and community group organisations. Current and past members of the teaching team include:

– Richard Lee, Just Space
– Agamemnon Otero, Repowering London
– Louise Francis, Mapping for Change
– Muki Haklay, Mapping for Change
– Laura Cream, UCL Public Engagement Unit
– Kim Townsend, UCL Public Engagement Unit
– Charlotte Barrow, Engineering Exchange
– Sarah Bell, Engineering Exchange
– Vera Bukachi, Engineering Exchange

IMPACT

Across the three sessions, 26 learners from UCL and industry have been trained in community collaboration skills. Of these, 23% were from industry (Arup); 19% were UCL staff members and 58% were UCL students. UCL participants came from 6 departments including:

– The Bartlett School of Environment, Energy and Resources
– Biochemical Engineering
– Civil, Environmental and Geomatic Engineering
– Electronic and Electrical Engineering
– Mechanical Engineering
– Medical Physics and Biomedical Engineering

The training received an average of 4.3 / 5 on the indicators ‘informative’, ‘worthwhile’ and ‘inspiring’ where 5 indicated ‘I strongly agree’. 

‘The overall themes and messages are very transferable to our work. Reminds us that we work for society!’

CPD attendee, Arup

‘It was worthwhile as I have thought about problems in my current research differently.’

CPD attendee, UCL
Ongoing funding for core staff and activities has been committed for 2016-2019 from the UCL Faculty of Engineering and the Bartlett Faculty of the Built Environment.

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PUBLICATIONS

REPORTS

BOOK CHAPTERS

CONFERENCE PRESENTATIONS


Bell, S. (2014) Ethics of community based engineering research. Forum on Philosophy, Engineering and Technology, Blacksburgh, VA.


INVITED EXTERNAL SEMINAR PRESENTATIONS
Bell, S. (2015) Upstream Community Engagement in Engineering Research, University of Western Australia.

To encourage integration of STEM and the arts, the EngEx held a poetry competition with winners from UCL Engineering and from the wider London community, plus a commissioned poem from a professional poet, on the theme ‘Engineering and Communities’. The winners were chosen by a panel comprising a member of the EngEx, our commissioned poet Dan Simpson and Matthew Beaumont from UCL’s English Department:

**COGS by Dan Simpson**

People are frustrating: gloriously unquantifiable so even the most perfectly designed system can be broken by user error and sometimes we’re broken ourselves or don’t fit into the precisely delineated shapes needed to run a machine effectively.

We are imperfect gears with our crooked teeth and irregular sizes ill-fitting faces and unbalanced flanks made of every kind of unsuitable material revolving at whatever speed we want sometimes stopping entirely.

But we mesh better than anyone expected or could have intended our cogs somehow interlocking engaging each other to spin faster to create power and momentum revolving around a common axis.

There is friction as we rub along together backlash and grinding as we change direction sparks fly – and from electricity comes power the discord of an orchestra tuning up giving way to a harmonic drive forwards the noise of progress generating ever-brightening light.

We are all the sun and we are all the planets in fluctuating orbit about each other a galactic neighbourhood of rotating forces individually we move in moments communally we move history: we are greater than the sum of our parts.
WINNER
written by an engineer

TINKERER by Andrew Greatorex

We’re born wide eyed
Curious, surprised
Poke around in life
As we tinker and pry
Of those, just a few
Will always unscrew
The toys in the room
Forever consumed
Roll down the years
It’ll soon be clear
More than a career
We were born engineers.

WINNER
Written by a community member

SO THEY DO by Ruairi McNally

They like beers
and tiers on buildings,
blocked together,
iron on brick on iron.
Like jenga at night
on pub tables.
Glasses cleared
never sloping,
always straight.
It’s their career
to be precise.
Never wrong,
always right.
They are engineers,
without fear.
They like beers.
UCL STAFF AND STUDENTS INVOLVED IN ENGEX ACTIVITIES

Sabio Nagore, Bartlett, staff; Cesar Cortes Quiroz, Biochemical Engineering, staff; Mehran Moazeni, Biomedical Engineering, staff; Andrea Sella, Chemistry, staff; Folashade Akinnmolayan, Chemical Engineering, staff; Philippe Duffour, Civil, Environmental and Geomatic Engineering (CEGE), staff; Muki Haklay, CEGE, staff; Louise Francis, CEGE, staff; James Haworth, CEGE, staff; Tao Cheng, CEGE, staff; Helena Titheridge, CEGE, staff; Kamal Achuthan, CEGE, staff; Tom Cohen, CEGE, staff; Vera Bukachi, CEGE, staff; Ilan Adler, CEGE, staff; Liora Malki-Epshtein, CEGE, staff; Andy Chow, CEGE, staff; Bryan Cahill, CEGE, staff; Pedro Ferreira, CEGE, staff; Roger Mackett, CEGE, staff; Kate Crawford, CEGE, former staff; Rae Harbird, Computer Science (CompSci), staff; Catherine Holloway, CompSci, staff; Herve Borrion, Crime Science, staff; David Selviah, Electronic & Electrical Engineering (E&E), staff; Giles Thomas, E&E, staff; Francesco Fioranelli, E&E, staff; Wing Ng, E&E, staff; Marc Sans Zamora, E&E, staff; Charlotte Johnson, Energy Institute, staff; Matthew Beaumont, English, staff; Aleksandra Herbec, Health & Behaviour Research Centre, staff; Gurdane Virk, IEDE, staff; Jack Stilgoe, Maths & Physical Sciences, staff; David Wright, MechEng, staff; Richard Bucknall, MechEng, staff; Clare Elwell, Med Phys & Biomedical Engineering, staff; Kim Townsend, Public Engagement Unit (PEU), staff; Lizzy Baddeley, PEU, staff; Laura Cream, PEU, staff; Sarah Chaytor, Head of UCL Public Policy, staff; Paul Marshall, UCLIC, staff; Eirini Gallou, Bartlett, student; Felicity Davies, CEGE, student; Shiela Birungi, CEGE, student; Karla Cervantes, CEGE, student; Yaodong Jia, CEGE, student; Kell Jones, CEGE, student; Colin Rose, CEGE, student; Andrew Greatorex, CompSci, student; Nafiseh Vahabi, E&E, student; Hayman Shams, E&E, student; Henrik Utvik, E&E, student; Sunyoung Joo, Energy Institute, student; Adam Byrne, Geography, student; Xuchuang Wang, MechEng, student; Zhixin Qi, MechEng, student; Siqi Zhang, MechEng, student; Xinyue Jiang, MechEng, student; Tian Wang, MechEng, student; Daniil Nikitichev, Med Phys & Biomedical Engineering, student; Lara Fernandez Cerezo, student; Yan Xia, student
PUBLIC PARTICIPANTS IN ENGEX ACTIVITIES

Kate Beeching, Affinity Solution; Gordon Deuchars, AgeUK; Jane Fiona Cumming, Article 13; Christina Man, Arup; Geoffrey Morgan, Arup; Milly Hennayake, Arup; Steven Johnson, Arup; Richard Fletcher, Arup; Catherine Rankine, Arup; Christine Fent, Beam; Roger Madelin, British Land; David Fell, Brook Lyndhurst; Adam Webber, Camden Council; Kiran Patel, Camden Council; Gary Hayes, CGCA; Eddie Chan, Chinese National Healthy Living Centre; Janet Laban, City of London Council; Stephen Tindale, Climate Answers; Jeannie Dawkins, Close the Door; Riz Mirza, Community Arts Projects; Rokiah Yaman, Community by Design; Josie Warshaw, Cyclistic/Brent Eleven Streets Residents Association; Mary Sizer, DigitaLBi; Calum Murdoch, Ealing Council; Virginia Fassnidge, Ealing Friends of the Earth; Bob Harris, Earthdome; Eleanor Margolies, East Dulwich Regeneration; Robert Harris, Eco Building; Sarah Henderson, Economy of Hours; Steve Matthews, Emergent Research; Ramona Williams, Eyes for Success C.I.C.; Talal Karim, Finsbury Park Trust; Jenny Bates, Friends of the Earth; Waseem Malik, FTM Solar Ltd; Bex McIntosh, Global Action Plan; Cassie Sutherland, GLA; Tim Roberts, Good Measures Limited; Danielle Johnson, Green Space Regeneration; Mina Kakaiya, Harrow in Business; Gavin Tokely, Innhabitat Ltd; Toby Morgan, Islington Council; Nicola Stockton, JLL; Robin Brown, Just Space; Richard Lee, Just Space; Mas Evers, Kennington Park Estate Tenants Association; Andrew Grieve, King's College London; Tim Taylor, Korimako (LB Sutton); Sue Lloyd, LBBB; Simon Hicks, London School of Economics; Monica Ganan, London Southbank University; Raymond Lee, London Southbank University; Alex Hale, London Sustainability Exchange; Samantha Heath, London Sustainability Exchange; Ben Hudson, London Sustainability Exchange; Sharon Hayward, London Tenants Federation; Pat Turnbull, London Tenants Federation; Marcus Ambler, Miatta; Kathleen Towler, Millefleurs; James Moulding, Open Sensors; Dan Simpson, poet; Jess Gold, Project Earth Rock; Alise Kirtley, RecommendMe; Chris Carthy, RUSS Community Land Trust; Katerina Papavasileiou, Open-City; Sean Duggan, Peckermans Wood Eco; Adam Pop, Phoenix Community Housing; Kevin Burchell, Policy Studies Institute; Del Brenner, Regents Network; Agameonno Otero, Repowering London; Sagar Sumaria, So Ethical Media; Hannah Short, SOAS; Bill Legassick, Southwark Council; Jessica Leech, Southwark Council; Katherine Jackson, Spitalfields City Farm; Mhairi Weir, Spitalfields City Farm; David Findlay, SS Robin Trust; James Robb, Sturgis Carbon Profiling LLP; Tom Walsh, Sustainable Merton; Masa Sprajcar, Sustrans; Stefanie Hughes, Tower Hamlets Council; Elizabeth Jenks, Transport for London; Diane Skidmore, Tulse Hill Community Group; Chris Twinn, Twinn Sustainability Innov; Justine Cawley, University of East London; Heather Millen, Veolia; Helen Porter, Waltham Forest Friends of the Earth; Sue Morgan, Wandle Valley Regional Park Trust; Mike Granh, Wandsworth Living Streets; Jane Stiles, Waterloo Action Centre; Sharon Gordon, West Euston Partnership; Diana Young, West Euston Partnership; Kathryn Gifford, Westminster Arts; Myfanwy Taylor; Sandra McLeod; Juliette Aplin; Clare Morris; Clare Wigley; Daniel Navarro; Eisen Chok; Isabella Gaupmann; Jerome Boisard; Joly Chu; Natasha Eve; Nicky Gavron; Vicki Lockhart; Richard Jackson; Omotolani Sulu; Mike Cushman; Lesleyanne Forman; Elisa Bruno; Evelina Nosirevaite; Frances Bradley; Doug Gleave; Hannah Brown; Aimee Coggins; Aisling Lee; Matteo Mazzieri; Anna Kuznetsova; Carl Brown; Nicole Coates; John Cox; Anna Yang; Andrea Casalotti; Ben Kennedy; Bill Ellison; Clare Armstrong; Gary Hayes; Janusz Carmello; Jeremy Drake; John Griffiths; Judith Chegwidden; Mariam Turay; Peter Hartley; Rosalind Readhead; Roy Tindle; Sandra Jarzemska; Sergio Caetano; Tessa Jelen; Thomas Murphy; Tim Henderson; Wilfried Rimensberger
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