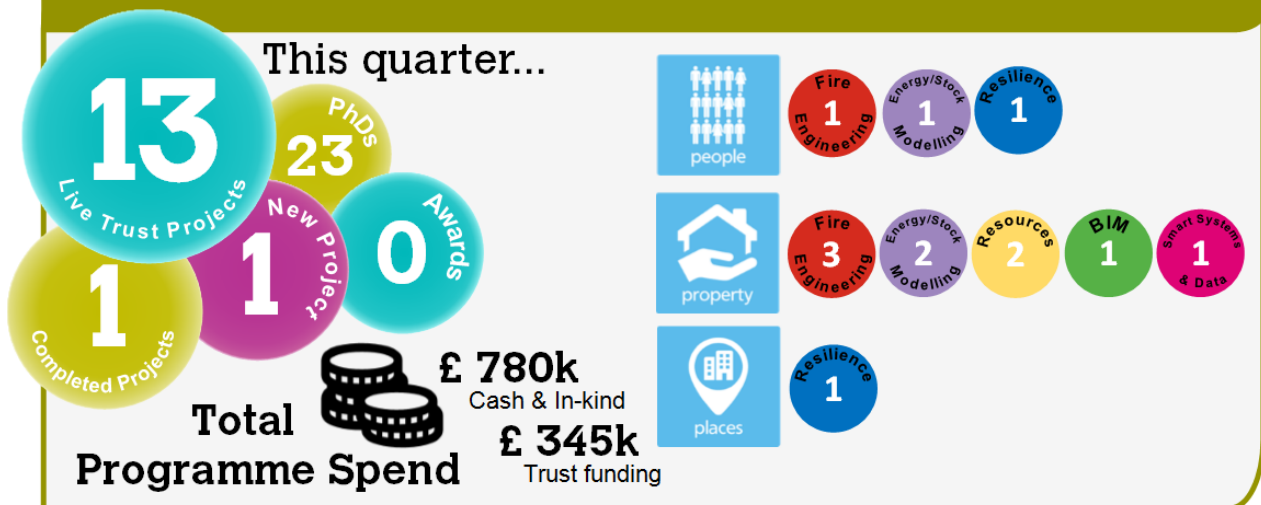


# **BRE Trust Programmes Quarterly Review April - June 2018**

**Prepared by the BRE Trust Secretariat**



# Executive Summary



This report summarises the progress of the BRE Trust Programme during April – June 2018, including the research, dissemination, skills and university projects. Also included are related activities including wider promotion of the Trust outputs via articles, publications, presentations and events. The outreach of these various platforms in sharing content are tracked and quarterly stats also included.

There are currently 13 live projects in the Programme with £345k of Trust funding committed, also attracting over £750k cash and in-kind funding from other sponsors and partners, with 1 completed project and 1 new project starting in this quarter.

There are currently 23 active PhD studentships including 3 newly approved studentships in this quarter.

New project approved:

**Investigation of the use of TGA for fingerprinting analysis on insulating foams**

**12.5k Trust, £25k, £3.5k In-kind;** The use of TGA (thermogravimetric analysis) fingerprinting is being research to verify if it's application can be used to

introduce a more robust certification of LPS 1181 to allow for yearly audits or formulation changes to be better compared. It is not yet known how applicable and replicable the TGA technique is in this application, this research will verify this and potentially lead to a revision of the current standard.

Further information on this and other projects in the programme can be found within this report.

This report particularly focuses on projects with a Health and Wellbeing theme including a feature on the Healthy Cities Index which originated from the BRE Trust *Future Cities* thematic (2012-2015). The thematic was introduced with the motivation to understand and improve urban health through the collaborative efforts of multiple sectors beyond that of the health sector. Since its inception in 2014, the HCI project has seen the development of an indicator methodology, the BRE Causal Pathways Framework, and a number of application case studies.



# Contents

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Healthy Cities Index	1
Project Progress - People	3
Project Progress - Property	5
Project Progress - Places	8
Outreach and Dissemination	9
Partnership Programme	16
Appendix A: Project Status	21
Appendix B: Current Studentships	22

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## Healthy Cities Index

The Healthy Cities Index (HCI) originated from the BRE Trust *Future Cities* thematic Programme (2012-2015), implemented to understand and improve urban health through the collaborative efforts of multiple sectors beyond that of health. Since its inception in 2014, the HCI project has seen the development of an indicator methodology, the BRE Causal Pathways Framework, and a number of application case studies.

In developing an indicator methodology through stakeholder engagement, and the development and analysis of an evidence-based index, some of the concerns associated with indexes such as the HCI have been addressed. These include issues associated with lack of research, data availability/quality and the hiding of inequalities.

The methodology is based on 10 key principles, which helped to guide the selection of indices that were appropriate, representative, well-informed and agreed on by professional consensus.

A further, often cited concern regarding indicator tools is their varied interpretation. To avoid misunderstandings, the Causal Pathways Framework (a visual communication tool) was developed to explain the relationship between urban environment exposures and the outcomes, as explained through the health impacts of the behavioural reactions to direct impacts. In doing this, the framework clarifies what, why and how health impacts occur as a result of the built environment.

The applicability of the HCI has been showcased in two case studies where it is being applied to decision making scenarios in Dubai and in the London Boroughs of Southwark and Lambeth. In Dubai, the HCI acted as a tool for encouraging collaboration between city departments. In Southwark and Lambeth it was used as a guiding principle for developing monitoring indicators related to health and wellbeing for the areas' planning policies.

The BRE HCI is, to the best of our knowledge, the first global index to focus on the impact of urban physical environments on health and wellbeing. Value has already been found in its ability to raise awareness of the complex impacts of urban environmental exposures, as well as in the development process that addressed common concerns with tools such as the HCI. As this development and optimisation phase of the HCI concludes, it provides a platform for further research and innovation regarding further technical tools for addressing urban health impacts, as well as a means for developing BRE's business opportunities regarding sustainable cities. Potential lines of development and research being explored include:

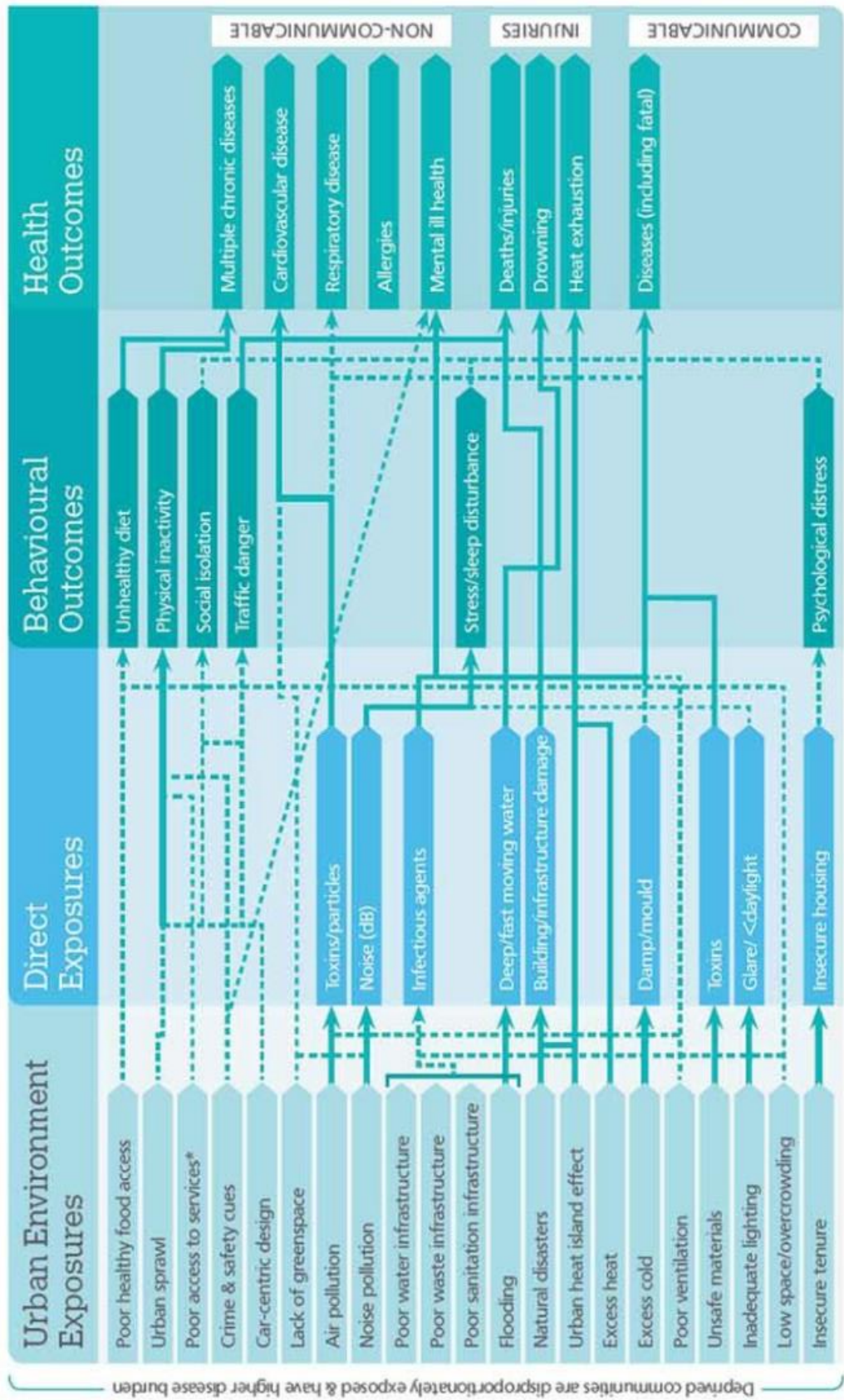
(i) an educational demonstration resource, helping to support the case for implementing the HCI in planning and policy design processes, and  
(ii) the research and creation of a Solutions Pathways Framework to complement the Causal Pathways Framework and help parties implement successful actions to mitigate health impacts.

Helen Pineo, BRE's Associate Director of Cities, gives us an insight into the development of the HCI, and an update on current outputs and research areas in the following video in the BRE Trust Council SharePoint:

**Healthy Cities Index.mov**

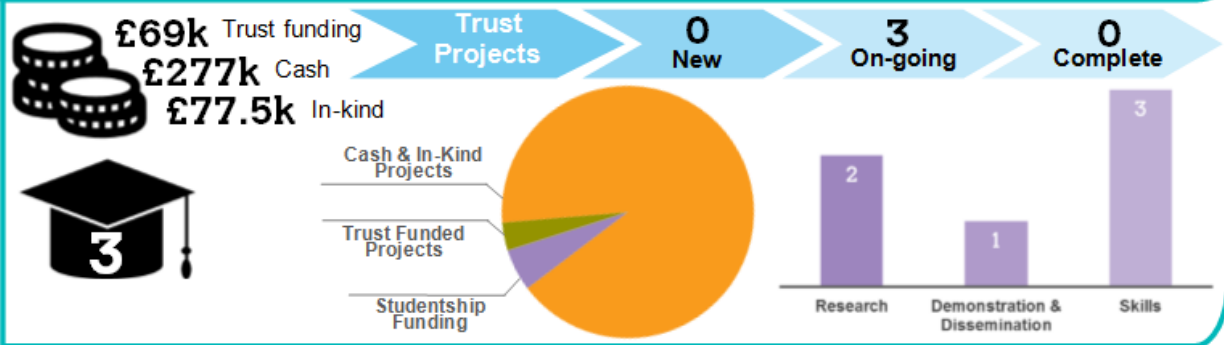
*BRE Trust Council - BRE Trust Council Documents\201819\Q1 4th Oct Meeting - Reporting April - June 2018*

# bre BRE HCI Causal Pathways



## Project Progress – People

The social interaction of citizens with the built environment, exploring health, productivity, safety and wellbeing. Considering the impact of demographic changes and cultural differences on future assets.



### On-going Project – Fire Protection: Digital Technologies & Personal Wellbeing

**£28k Trust, £50k cash contribution, £35k in-kind**

This research project with the FIA into fire deaths is progressing well. The Scottish Fire and Rescue Service and the Scottish Government have expressed keen interests in being actively involved and have collectively contributed a further £12.5k to support this research. They have also requested an investigation into whether the greater use of sprinkler systems could have reduced fire deaths and serious injuries in the cases being investigated. This additional research will provide very valuable information, enabling the Scottish Government to update its policies on the use of sprinkler systems.

The first phase of the research study, using the Fire and Rescue Service Incident Recording Database (IRS), is well underway. As expected the majority of fires occur in kitchens (74%), then

living rooms (7%) and then bedrooms (5%). However, fire fatalities data revealed that most fatalities was in living rooms, followed by bedrooms and then kitchens. This initial finding shifts the focus away from kitchens.

In terms of fire fatalities and serious injuries, it has been observed that dwellings of single occupancy – particularly in houses and bungalows – have the greatest number of fire fatalities. The study has also shown that careless handling of naked flames is the greatest cause of fire fatalities, with those involved demonstrating either inadequate disposal of cigarettes or subsequently being asleep or unconscious. As anticipated, the study has so far demonstrated that those in the age ranges 61 to 80 and 80 + have the highest fatalities proportional to the total number of incidents.

Currently, cross-correlations of the data are underway to determine the demographic profile and the surrounding conditions of those most at risk.



## Completed Project – Home for Life

### £15k Trust, £100k cash contribution, £35k in-kind

This project involved three project partners collaborating with BRE to design a best practice dementia friendly home. The project ideas were based on 'Design for Dementia', co-authored by Bill Halsall of HLP and Dr Robert MacDonald of LJMU, as well as Loughborough University's ongoing research programme.

The design of Chris & Sally's house was informed by research carried out by Loughborough University with methodologies based on 'personas' and human factor ergonomics (HFE), including home-based activities to maintain independence and wellbeing. Personas are representations of archetypal users of a specific product or service.

They can be useful in design as they contain information on the characteristics of users, including their needs and preferences. This can be particularly helpful in designing built environments for people with dementia, as personas provide a means of incorporating their needs, limitations and abilities without needing them to express this information personally. This is useful because people with dementia are likely to experience difficulties with verbal communication from an early stage, which increase in severity as their dementia progresses (World Health Organization, 2012).

There were no known pre-existing personas that specifically represented people with dementia. It was therefore necessary to develop a series of personas that embodied their archetypal needs, limitations and abilities.

The Chris and Sally's house project aimed to provide a suitable domestic environment for people with dementia, which would meet their changing needs right through to the later stages of the disease. The personas highlighted the needs, limitations and abilities of archetypal people at different stages of dementia and supported the use of HFE in the project.

They acted as a guide against which proposed designs could be appraised and challenged based on their suitability for people at different stages of dementia. This was particularly useful as team members spanned a number of different professional backgrounds, including ergonomics

and architecture, and as such had knowledge and experience in different areas. Using the personas as a communication tool within this multidisciplinary team helped to ensure that the needs, limitations and abilities of people with dementia remained a priority throughout the design process.

A demonstration house featuring the findings of the research has been put *in situ* at BRE's Innovation Park, Watford.

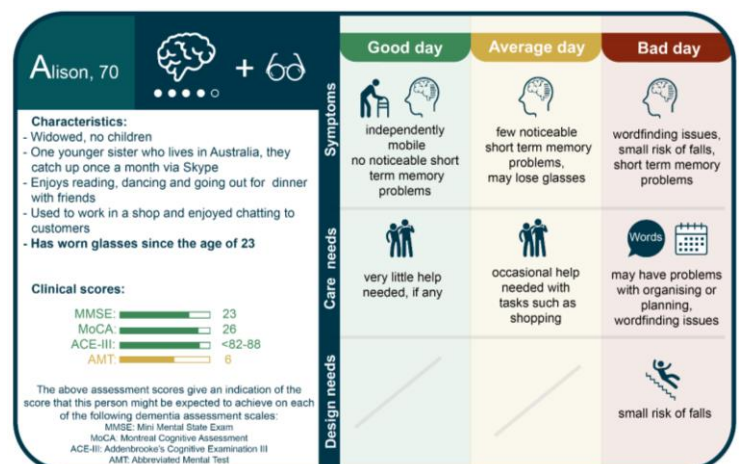
The next steps for this project include using the guidance document created to develop an adaptation strategy which could inform physical improvements to a property and allow someone with dementia to age well at home. This project is a demonstration project and a research platform allowing BRE to explore design responses to the pressing social issues which underlie the crisis of dementia.

An outcome of this work has been a suggested building assessment approach, focusing on adaptations for people with dementia. It is recommended that this approach is further developed to include the following:

- stakeholder engagement to identify the need for, and scope, of such an assessment,
- activity to develop the parameters and metrics that should be used,
- trialling the approach using case studies and/or pilot projects, and
- further refining and development.

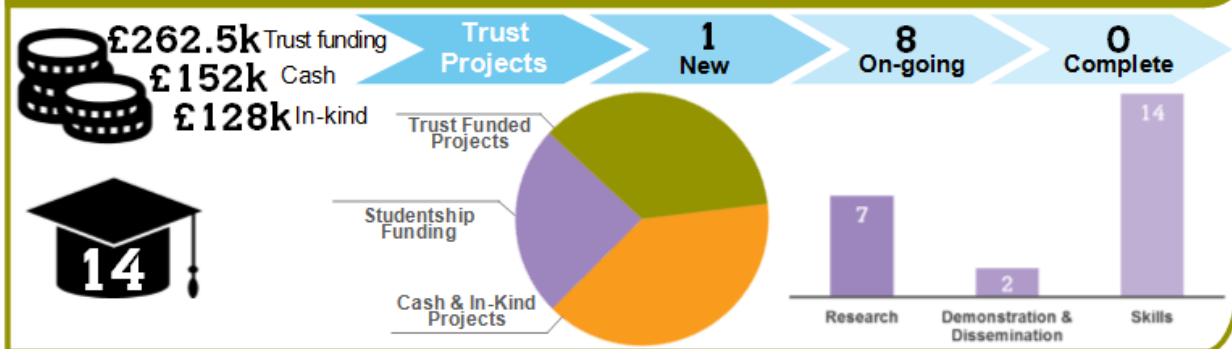
For further information on the project you can visit the BRE [website](#).

Or for further information on the personas mentioned please visit the Loughborough University [website](#).



## Project Progress – Property

The delivery of assets which are built and operated efficiently and sustainably, increasing value to businesses who occupy them. Resource efficiency, renewable and efficient energy and adaptability to future changes of use and critical factors.



### New Project – Investigation of the use of TGA for fingerprinting analysis on insulating foams

#### £12.5k Trust, £25k, £3.5k In-kind

When build-ups have been tested for certification to the LPS 1181 standard, the formulation of the insulating foam material is often altered. BRE's Passive fire team propose that, in addition to cone tests, TGA (thermogravimetric analysis) fingerprinting of the product initially certified/tested is introduced to assess the extent of change to the foam, allowing for yearly audits or formulation changes to be better compared.

The project team has started to develop a cone calorimeter comparison spreadsheet to help compare results of testing to ISO 5660-2, to review any changes in performance over time with audit samples, along with the review of performance with changes to raw materials.

A review of appropriate Thermogravimetric Analysis (TGA) equipment and test protocols will follow, which may also include Fourier Transform Infrared (FTIR) analysis on decomposition products. Initially the same sample at different sections of the foam will be reviewed to assess the homogeneous nature of foam materials during manufacture, and any variation within samples sets to review repeatability of testing. The results will show the suitability of the TGA method in fingerprinting foam materials for general audit samples.

The review of the suitability of the TGA will result in a draft revision of the current LPS standard to potentially include TGA testing, or to include the requirement as part of a more general audit requirement for Factory Production Control (FPC) and sample approval.

### On-going Project – Determining the Optimum replacement period for detectors

#### £29k Trust, £25k cash contribution, £12.5k In-kind

This investigation of when best to replace smoke detectors, being conducted in collaboration with the FIA and other partners, is progressing well. Four new partners, Scottish FRS, Scottish Government, Detector Testers and Kings College London, have agreed to support this project with additional funding – both cash and in-kind. These additional funds will permit more samples to be taken *in situ*.

The stakeholder group has agreed on a test methodology that will be used to measure smoke alarms and detectors *in situ*. The method has been demonstrated, with evidence presented on its repeatability, on five different detectors.

To establish the pass limits for measurements in the field, it was agreed to first test – for reference – a number of approved smoke alarms and smoke detectors in BRE labs, before conducting the *in-situ* tests. Devices are currently being identified and procured for measurement. Whilst this is an additional step, it is considered a necessity that will ultimately lead to more robust outputs.

The stakeholder group have proactively contacted their clients and contacts in the field, for premises that could be used to test old detectors. A number have already been identified and measurements will begin in due course.

Next stages are to procure reference devices, test them, establish limits and then perform the *in-situ* tests. The project is still on track to deliver results by the end of this year.



## Ongoing Project – Digital Built Asset Reporting Platform

The purpose of this project is to develop a reporting platform based on BREEAM In-Use output data. The platform will allow for the comparison of different BREEAM In-Use assessments within National Scheme Operators (NSO) and non-NSO territory in one digital location. The aim is to allow the various users to receive instantaneous results in the format they require and export these results in a reportable format. This will create common reporting frameworks and KPIs for the various user groups (fund managers and portfolio owners for example) and building types (such as retail, office and industrial) that can be used in CSR reporting and improvement, and action planning.

Although the data contained in the system will always remain the intellectual property of BRE, the broader industry benefit will be obtained by enabling a much more flexible approach to utilising this data.

It will provide organisations with increased visibility of their asset performance, spanning multiple NSO territories, and will enable them to interrogate their data in various ways. The platform will be developed to allow for data to be pulled in from multiple BREEAM platforms through an application programming interface (API) in the future.

The first work package of this project has been delivered. Ongoing industry consultations will be carried out as relevant documents and test versions of the platform are produced.

A second NSO workshop was held by teleconference on the 4<sup>th</sup> June to start Work Package 2. This looks at the product description and NSO specific issues, such as data conductivity, the APIs, training and any contractual issues. A series of follow-up teleconferences have been planned with each of the NSOs to address their individual API and client access issues.



## Ongoing Project - Circadian Rhythms

### £30k Trust, £15k Cash contribution, £30k In-kind

BRE is currently undertaking field research on circadian lighting, which is tunable lighting that can alter its colour and intensity. Circadian lighting aims to improve people's alertness during the day, or during working hours, using bright light. It then switches to lower brightness and warmer coloured lighting when it is time to relax. Funded by the BRE Trust and CIBSE, the research project investigates when is the best time to have the high intensity, cool coloured lighting, and for how long, and when to turn it down and make it appear warmer.

The field study is being carried out in an open plan office using 23 participants. Various conditions are being administered over several weeks in winter months, including constant fluorescent lighting and variable LED lighting. Site measurements, lighting monitoring and computer modelling are combined with subjective and objective measures of occupant reaction. These include questionnaires, regular pop-up questions and computer-based performance tests, and monitoring of light exposure and level of activity of participants using activity tracking watches.

Two lighting conditions have been administered to date:

- Condition 1 – baseline condition using existing fluorescent lighting (19 February – 2 March 2018)
- Condition 2 – first variable lighting condition using new LED lighting (12-23 March 2018)

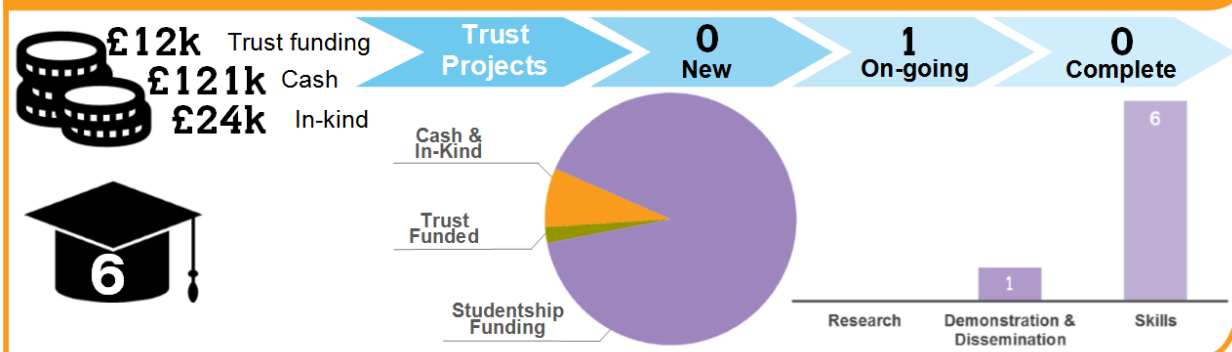
Additional conditions of variable lighting will be administered once clocks revert to Greenwich Mean Time (GMT) on 28 October 2018. All experimental work is planned to be completed by December 2018.

Participant responses to regular questions and computer-based tests are assessed to establish correlations between key indicators for participant performance (subjective alertness, reaction time and concentration) and measurement and calculation results of circadian light metrics for each condition (equivalent melanopic lux EML; melanopic daylight equivalent illuminance MDEI; and circadian stimulus CS). Participant responses to general questionnaires following each condition are also analysed and compared between the different conditions to assess potential impacts from variable lighting. These results are also correlated with the activity level data and the environmental data (temperature and relative humidity). The project seeks to determine how the effects of circadian lighting on occupants' health and wellbeing are linked with circadian lighting control schedules. The aim is to identify optimal control strategies for circadian lighting, and produce associated guidance so that health and wellbeing benefits are maximised. The results will be disseminated through a BRE Information Paper, giving guidance on circadian lighting control settings, and a trade journal article presenting findings of the field experiments and recommendations for circadian lighting control settings.



## Project Progress – Places

The robustness and resilience of communities and cities to natural and man-made external environmental influences. Climate effects, biodiversity and the interaction between buildings and their surroundings are a priority.



### On-going Project – Healthy Cities Case Studies – Knowledge Dissemination

As part of a refreshed effort to apply the outputs from the Healthy Cities Index (HCI) work stream, a case study knowledge dissemination piece is to be carried out. This stems from case studies that have been drafted for the HCI website, as well as the known need for demonstrating how to apply the findings from the HCI with multiple stakeholder involvement.

By creating a complementary resource, the appropriateness of the HCI can be demonstrated. This is of particular use to the implementation of the index, as effective actions require the engagement of multiple stakeholders.

In providing examples of how this collaborative effort can work, future application of the HCI can be promoted.

Currently the case studies are in need of revision. The first action to be undertaken is the comprehensive update of all case studies, ensuring they contain the latest findings and are presented in the same format to provide comparative details on various subject areas. This revision will also include information on the latest research in the field of built environment health and wellbeing, an introduction to the HCI and an outline of the HCI's application in Dubai and Southwark & Lambeth Council.



# Outreach & Dissemination Activities

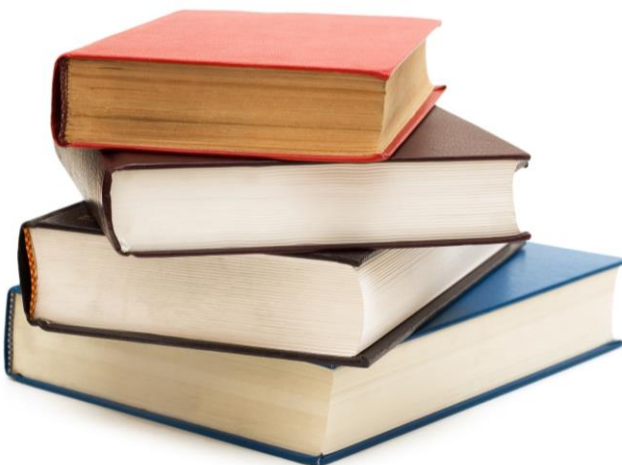
## 2018/19 outreach – Year to Date

Publications – 2 Titles Sales – 827 units Downloads – 33,207 Events – 6 New Articles - 24

### Sales & Downloads

Looking at download vs retail sales we can see that there is overlap in the topics reviewed by customers. These subjects include soakaway design, radon protection, site layout planning for daylight and fire protection, a number of which have recently been revised. Customers continue to buy concise guidance on good building practice in core areas such as building retaining walls and treating damp.

There were a total of 827 sales via IHS Press and BRE Bookshop in this quarter, a decrease of 35% compared to the last quarter (1,124). The total number of downloads from CIS for the quarter was 33,207, a decrease of 21% from the previous quarter (42,308) but equivalent to the same quarter last year. Information that will come from workshops and reports held by Designing Buildings Wiki will provide guidance on the information that the industry wants, helping BRE to provide a more targeted resource for industry that will improve sales and download figures.



### Outreach

#### BRE Bookshop

The more than 59,000 hits on the [BRE Bookshop website](#) between April and June 2018, represents a 61% increase over the last quarter.

The top 10 locations for visitors were:

Ireland – 49.75%	Hong Kong – 0.24%
U.K – 44.41%	Germany – 0.16%
USA – 0.89%	Canada – 0.15%
Australia – 0.34%	Malaysia – 0.15%
India – 0.29%	UAE – 0.14%

#### BRE Trust Website

Analytics are now available for the new BRE Trust Website. In the last quarter there has been approximately 2000 visitors to the site and over 4000 page views. Going forward, we will be able to monitor this traffic and analyse how best to use the platform to disseminate the work of the Trust.

#### Twitter

The @TheBRETrust Twitter account has been used for various promotions this quarter, from publicising events happening across BRE to raising the BRE Trust's profile and promoting the Charity's vision and mission. The students from our Partnered Universities consistently use the platform enthusiastically to promote their work in industry.

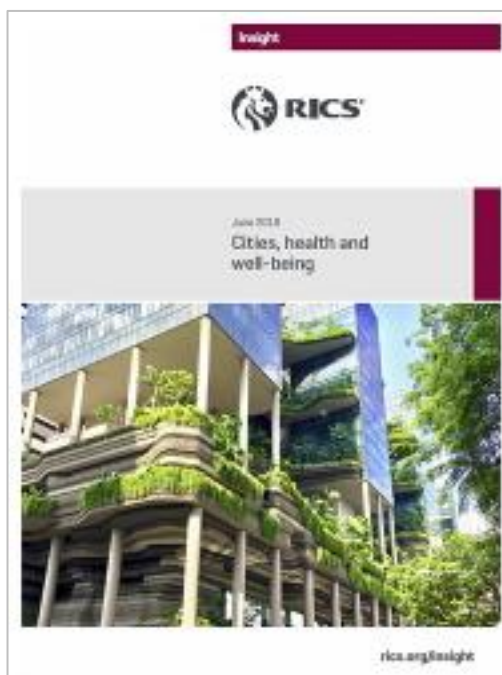
## Cities, health & well-being

This insight paper, co-authored by BRE's Associate Director of Cities, Helen Pineo, outlines the current state of health in the built environment, and the role our habitat has in causing and remedying chronic health problems and unhealthy lifestyles. It is estimated that up to 80% of citizens' health is influenced by the urban landscape. The causes and differing nature of city-influenced health implications are presented, with emphasis on the uneven distribution of resources, urban health 'advantage' and the number of global challenges and health trends that cities have to manage.

Chapters focused on 'Integrating health and well-being', 'Building standards and health' and 'The value of healthy places', showcase the key role of surveyors, planners, designers and other urban environment stakeholders in the development and management of healthy urban areas. Particular emphasis is given to:

- (i) integrated objectives that promote health and well-being, such as land-use policies aligned with economic development and environmental protection needs,
- (ii) certification standards that encourage better indoor environments (e.g. WELL, Fitwell), and
- (iii) intelligent, appropriate, design measures that create spaces with higher commercial value and lower environmental impact, maximising healthy design that makes financial sense (e.g. Green Infrastructure that improves wellbeing, diversity and resilience to overheating and flooding).

Through case study examples this insight report demonstrates how stakeholders can impact health, before concluding with how these stakeholders can integrate health and well-being into their next projects through a wide variety of means.

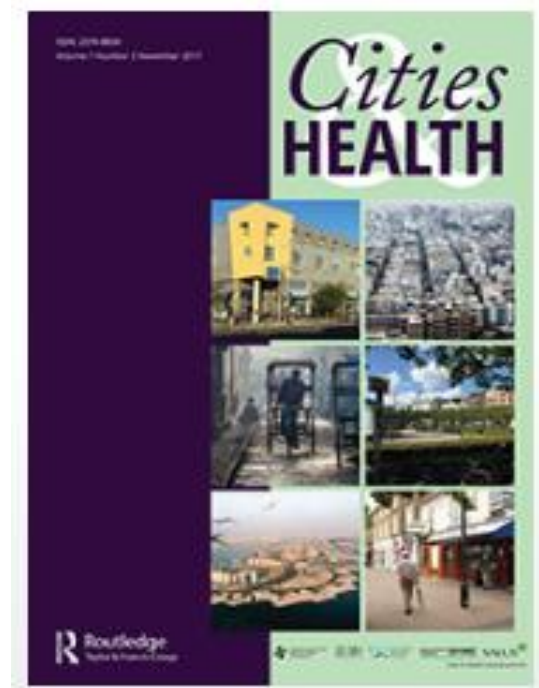


## Promoting a healthy cities agenda through indicators: development of a global urban environment and health index

As built environment practitioners' awareness of the health outcomes of policy decisions grows, there is an increasing need for new tools and guidance to promote decisions that support healthier cities. This paper outlines the development of BRE's international Healthy Cities Index (HCI), both in the context of scientific opinion on the use of indicator tools, and in relation to the iterative process of creating and successfully applying this indicator. In doing this, the paper illustrates how the HCI aims to align and improve the consensus on the use of such tools.

The paper outlines how the HCI's 58 indicators, organised under 10 environmental categories, were selected following a process of stakeholder engagement, evaluative research and available data sources. The result is a tool that has since been applied in two case studies in Dubai and London.

This paper not only chronologically documents the creation of what is believed to be the first global index focused on the impact of urban physical environments on health and wellbeing, but also signposts the required actions and research to enhance the effectiveness and impact of tools such as the HCI. It can be read on the open access site [here](#).



## Designing Buildings Wiki

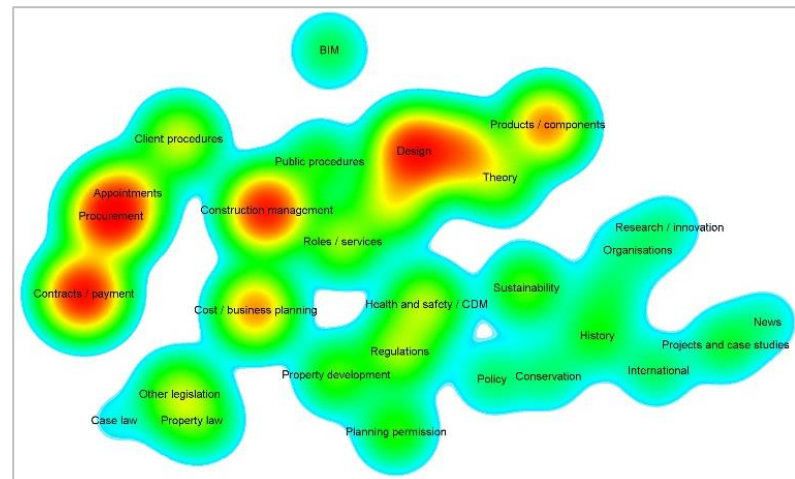
At the end of the 1<sup>st</sup> Quarter of 2018/19 there were 6,966 articles on the platform. 309 of these were BRE articles, with 24 new articles published in this quarter alone, with the content being viewed over 25,000 times. The top five BRE articles cover topics such as, BREEAM, fire, lighting and soakaway design.

The BREEAM Wiki platform, launched last quarter to advance knowledge sharing and collaborative solutions for the BRE family of sustainability tools, had 190 articles published. They can be seen at [BREEAM Wiki](#).

Designing Buildings Wikli also released their Annual report for sponsors in this quarter. Since its launch in 2012 the platform has been used by over 11.5 million people in the construction industry and received 35 million page views. It has helped to spread best practice, share innovation and prevent mistakes. Accumulating on average 33,000 page views per day and 4 million unique users, this site receives almost twice as much traffic as leading industry publications such as Building, bdonline and Property Week.

## Construction knowledge gap meeting

On the 9<sup>th</sup> May, Buro Happold, in collaboration with Designing Buildings Wiki, hosted a workshop attended by 20 industry representatives to establish whether there is support for forming a task group to address the construction knowledge gap. The workshop followed a [report](#) last year by Designing Buildings Ltd that highlights the severity of the knowledge gap in the construction industry. Workshop participants completed a survey after the event. This revealed that 93% of respondents believe that addressing the construction knowledge gap is either very or extremely important, with 19 of them confirming they would be interested in taking part in a task group to address the knowledge gap. Following this, a draft proposal for the industry task group is being prepared, to identify its role and activities, which will be actioned later this year.



What the construction industry reads about.



Photo courtesy of Designing Buildings Wiki:  
BRE Trust's Vicky Brown talking about the challenges of dissemination in industry

## Construction Sector Deal – Implementing the Constructing Excellence Vision

The [Construction Sector Deal](#) was announced in this quarter. The deal clearly reflects the important role that the sector plays in underpinning economic growth across the entire economy. The three strategic areas have clear alignment with the Construction Excellence Vision of digital, offsite manufacturing and whole life performance, driven by clients. Better procurement, fairer payment, digital and manufacturing technologies are areas that have been promoted for some time. This deal provides the opportunity to make change happen at a wide scale. With £170 million R&D funding through the Industrial Strategy Challenge Fund, there is serious money on offer for firms and projects who want to try something different and better. The deal is not just about major players, the focus on fairer payment terms and standardised procurement methods is excellent news for SMEs, which will be welcomed by the many SMEs that make up the regional and club network. The focus on people, specifically around attracting new skillsets and a diverse workforce into the industry, is very much aligned with Generation4Change, with its focus on the image of the industry. Benchmarking performance is a key element of the deal, and over the coming weeks and months Constructing Excellence will be ramping up its activities around KPIs and benchmarking.

## Challenging the mindset in nuclear construction – Construction Factory Thinking

The nuclear theme group of Constructing Excellence has published the first report in its Productivity Series. The full report can be downloaded [here](#).

Key points made in the report: 'Poor productivity is not just a perception of the nuclear sector, but of the wider construction sector. It needs to be urgently addressed by all involved at all levels if such perceptions are to be altered and greater value delivered to clients reliably, and with confidence given to potential investors. It is a burning platform issue which is constraining the development and growth of the sector and therefore the national economy.

Productivity must be a high priority in any delivery model throughout the lifecycle. It is an outcome of numerous factors, including the environment and structures created by clients and the many inputs and constraints that impact the construction processes. There are views that client capabilities need to be strengthened, delivery models revised, the digital environment embraced, and the other factors improved. This paper was not written to address these aspects, but to highlight the change in thinking required. Using proven tools from other sectors could create a new mind set where productivity becomes the norm across all parts of the sector.

The third conference of the Constructing Excellence nuclear theme group was held in London on 10<sup>th</sup> May 2018. It addressed investors' views of the sector, which are cautious, being based on the perceived high construction risk. This discussion was followed by the launch of the first in the theme group's Productivity Series. [The event report can be read here](#).



## BRE Academy

The Academy is continuing to develop training courses, particularly on-line material through the Academy's digital team. In the last quarter, BREEAM New Construction [training](#) was launched, and a review of BIM training was started in light of the proposed changes to the ISO.

## BREEAM UK New Construction 2018 – New Assessor



## Awards

Applications for The Hawley Award, presented annually for the most outstanding engineering innovation that delivers demonstrable benefit to the environment, closed this quarter. The winner will be announced in later this year.

The award is being given in collaboration with [The Engineers Trust](#).

## Education Programme

The Education Programme is currently undergoing a review to assess areas for update of both content and delivery mechanism. The Trust aims to extend its outreach and to make it more engaging with schools both locally and nationally.

Workshops will be held with BRE's Science Technology Engineering & Maths (STEM) Ambassadors to gain feedback on the current programme and insight on how to further improve the approach. Schools and teachers who have previously attended school programme initiatives will also be approached and invited to stakeholder workshops. These will help us to find out what areas of the curriculum could best be aligned our programme, as gather teachers' ideas on how we can assist them.

## Work Experience

The BRE Trust team hosted two A-Level students from Stanborough School, Welwyn as part of a partnership forged during the BRE Trust's sponsorship of the school in the recent Engineering Education Services (EES) project. The students spent a week at BRE experiencing different facets of the business, including work in the Suppression Lab, Marketing Team and Digital Products.

They also experienced the Innovation Park and helped with developing ideas for the new Education Programme. Insight from students who have visited the site could make an important contribution to the review, and the Trust was fortunate to have two visiting students willing to take part. Hosting work experience students will now be another aspect to be explored as part of the review of the Education Programme.





## Events

### G4C - Bouncing Back: A new narrative for construction

On the 24<sup>th</sup> May [Constructing Excellence's Generation for Change](#) (G4C) hosted an [event](#) in London attended by over 50 current and future industry thought leaders. The aim of the event was to address the negative impact the current image of the construction industry is having on attracting talent and skills. Keynote speaker Sarah Beale, CEO of CITB, shared her experiences with delegates of being the first female CEO of CITB. The event was very interactive, with delegates sharing their ideas on improving the image of the construction industry. A start-up company recorded the event and the video can be seen [here](#).

### Visit by Deputy Premier of the British Virgin Islands

BRE welcomed Dr. the Honourable Kedrick Pickering, Deputy Premier & Minister for Natural Resources and Labour of the British Virgin Islands (BVI). Dr. Pickering and his delegation came to find out more about BRE's work, particularly the QSAND project and how it might support BVI in rebuilding after Hurricane Irma.

After the initial presentations, Dr. Pickering outlined the current situation in BVI, stating that 80-90% of buildings on the islands were damaged or destroyed, along with 90% of boats. The damage to boats is particularly harmful to the economy, as fishing, sailing and tourism make up a very large proportion of BVI's economy.

Dr. Pickering was also interested in photovoltaic installation, and methods of retrofitting solar panels in order to both increase long-term sustainability and enable homes to continue accessing power after hurricanes. He noted that after Hurricane Irma, one of the most difficult challenges was the lack of electricity as all the power lines were down,



British Virgin Islands delegation with Senior members of BRE staff.

so finding a way to collect and store solar energy to power homes in the aftermath of disasters is of key interest.

Another area of interest was thermal comfort, specifically sustainable cooling methods for homes such as passive cooling and building design to reduce temperature.

Discussions will continue with the BVI Government about how BRE's expertise can be best used to support BVI. A starting point will be the use of the QSAND sustainable recovery tool to create a pathway for resilient rebuilding on the islands.

### Chris and Sally's House Launch – Living with Dementia

BRE's Dementia friendly house was officially opened this quarter. BRE hosted an event to commemorate the launch attended by 150 guests.

The event started with a networking lunch followed by a presentation from the project lead, Director of the BRE Innovation Park network, David Kelly. He was followed by the key note speaker, Lord Best, who is currently Chair of the all Party Parliamentary Group for Housing and Care of the Elderly, and has many years' experience in this area, including the issue dementia.

Representatives from two of the project partners – architecture firm Halsall Lloyd LLP and Loughborough University – then gave delegates an insight into dementia and the journey of this project.

Listening to the presentations were representatives from a range of different industry stakeholder groups, including local councils, charities, the NHS, architecture firms and multi-national companies that specialise in dementia, who were also given a tour of "Chris and Sally's House."

The event succeeded in bringing different industry sectors together, giving delegates the chance to network and discuss the future of dementia friendly homes. It enabled the sharing of knowledge, experiences and projects that can have a positive impact for the sectors involved and for people suffering with dementia.



Lord Best cutting the ribbon with BRE CEO Niall Trafford.

## CRS Event

On the 1<sup>st</sup> June Loren Lockwood and Minar Thapa Magar from CRS (Catholic Relief Services) and HRRP-Nepal (Housing Recovery & Reconstruction Platform) visited BRE. They provided updates to BRE staff on the progress of the QSAND-supported reconstruction project in Gorkha District, Nepal, following the 2015 earthquake, highlighting the areas where QSAND had added value to their project. QSAND has proven particularly useful in expanding CRS's monitoring and evaluation programme in Nepal. For further information on these organisations please visit their websites:

[www.crs.org](http://www.crs.org)

[www.hrrpnepal.org](http://www.hrrpnepal.org)

## Sustainable St Albans

In April the BRE Trust sponsored Sustainable St Albans, a local charity set up to find positive and creative ways to raise awareness and address the challenges of climate change, live more sustainably and move towards a low-carbon economy.

BRE Watford also opened its doors on 23<sup>rd</sup> April for special presentations from the experts at the Innovation Park, followed by a Q&A session. Guests were also invited to view the demonstration houses on the park. Free self-guided tours were also offered throughout the whole of Sustainable St. Albans Week. As a sponsor the Trust was given a spotlight on the Sustainable St Albans website – see the full [article](#).



Longlisted award for Barclays developing resilience competition collected by Matthew Barker (BRE) and Tessa Lee (BRE).

Photo credit: BITC

Over the week there were various well publicised events, clearly showing the BRE Trust sponsorship, including the clearing of parts of the River Ver (that runs through St Albans) by volunteers who included BRE's Peter White. For further information on the work carried out by the charity you can follow it on Facebook @SustainableStAlbans

## Flood House Awards

### Flood and Coast Project Excellence Award 2018

BRE's Flood Resilient Repair Home this year was shortlisted for the Flood and Coast, Project Excellence Awards 2018. The home was nominated in the Innovation category, which was defined as identifying and implementing new ways of meeting challenges to deliver projects better, faster, more safely or more efficiently. After attending the awards evening earlier this year, the Flood Resilient Repair Home was selected as the winner of this category

### Barclays Developing Resilience Award 2018

This year the home was longlisted for the "Barclays Developing Resilience Award." This award was for businesses supporting SMEs to prepare for, respond to and recover from disruptive events, which in turn benefits the community in which they operate. The home was successful in the longlisted category and has now proceeded through in to the shortlisted category for this award. The results of the "Barclays Developing Resilience Award" 2018 shortlist Winners will be announced later this year.

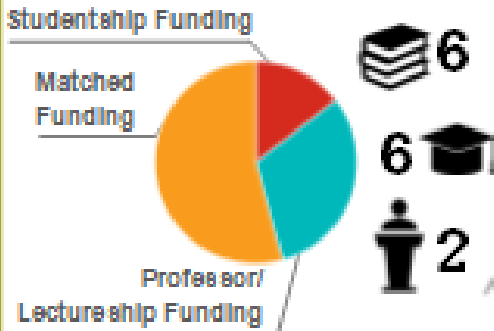


Matthew Barker (BRE) collecting award for Innovation in the Project excellence awards 2018.

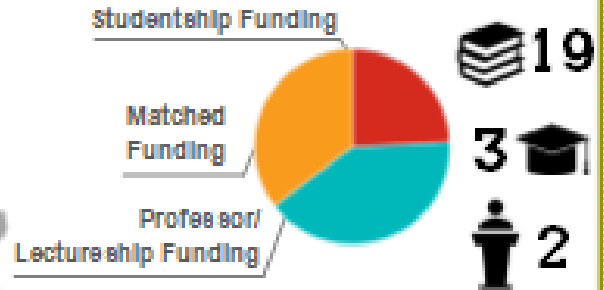
Photo courtesy of Flood and Coast.

# University Summary YTD 2018/19

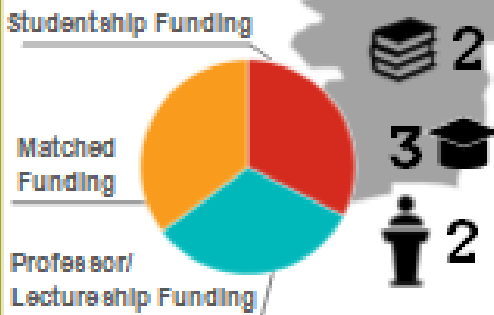
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Energy Systems Research Unit



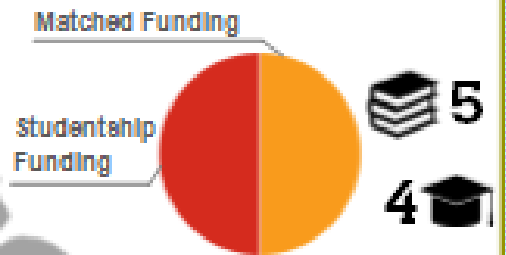
**University of Edinburgh**  
Centre for Fire Safety Engineering



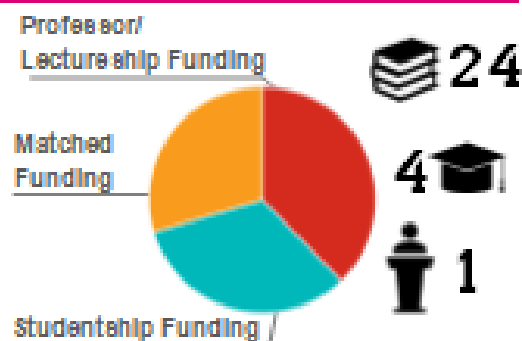
**Cardiff University**  
Centre for Sustainable Engineering



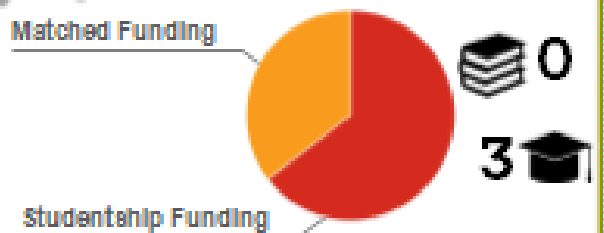
**Loughborough University**  
School of Architecture, Building and Civil Engineering



**University of Bath**  
Centre for Innovative Construction Materials

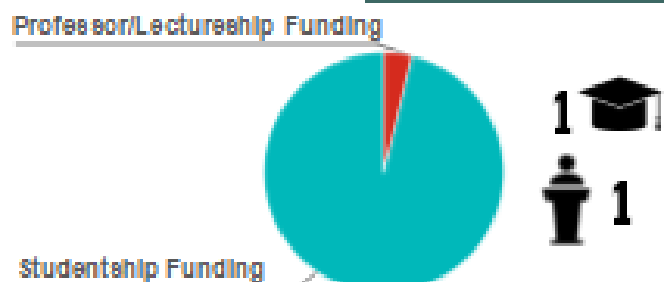


**University of Hertfordshire**  
School of Engineering and Technology



**Other University Partnerships**

- University of Brasilia
- University College London



**KEY**

- Number of Outputs (stack of books icon)
- Trust Funded Studentships (graduation cap icon)
- Trust Funded Lectureship/Professor (lecturer icon)
- Total Funding (pie chart icon)

# Partnership Programme

## Academic Partnerships – BRE Academy

BRE is partnering the University of Herts (UoH) in the delivery its Civil Engineering degree (BEng/MEng). This quarter the BRE Academy supported UoH during the visit from the JBM (Joint Board of Moderators) who can accredit the course. The JBM visited BRE as well as the UoH campus in Hatfield, and the overall report was very supportive of the course as a whole as well as the partnership with BRE.

Engagement continues across the university sector with BREEAM and BIM AG (Approved Graduate) qualifications being embedded into various university courses. BREEAM AG provides a good foundation for students working in construction and its interaction with BREEAM. It is a first step to becoming an assessor or an approved professional. Successful completion of the BIM AG course provides the foundation for students to be certified, provided they obtain the necessary practical experience.

## Hertfordshire LEP

The BRE Academy has been successful in securing £1.7m in matched funding from the Hertfordshire LEP to develop a state of the art, multi-use training facility on the BRE campus. The facility will directly address known failures in the construction labour market by addressing the combined skills and productivity gaps resulting from widespread changes in labour supply and construction methods. It will support our academic partners, such as Oaklands College, West Herts and North Herts colleges.

The facility's building will be one that can be refurbished using both modern and traditional construction methods, and will showcase new technologies, advanced manufacturing and digital construction.

The plans for the new training facility draw on Hertfordshire's refreshed strategic economic plan 2017-2030, the key themes contained in the Hertfordshire Skills Strategy 2017 (in particular lifelong learning, skills to drive growth and moving people in to higher value-added jobs) and the UK Government's industrial strategy.



## Studentship Programme

There are currently 23 active PhD studentships including 3 newly approved studentships in this quarter. The BRE Trust has committed £355k to this programme so far this year.

## New Studentships

### Coventry University

#### **“Calcined clays as a reactive alternative to fly ash as a binder in Portland cement concrete”**

Coal fly ashes (a by-product from coal fired power generation) have formed an essential part (UK market is 6 Mt pa) of the cement “binder” as a supplementary cementitious material (SCM) in many concrete construction elements and products. They give manufacturing and performance benefits and significant carbon savings when used to partially replace carbon intensive Portland cements (PC) in concrete. However, sourcing fly ash in the UK is becoming difficult due to the decline in coal fired power generation (full closure projected by 2025). Calcined (heat treated) clays are a potentially plentiful SCM material in the UK (as an alternative to fly ash) but they are not covered by current UK standards and concrete practice due to limited direct UK experience and knowledge of performance (at early ages and long-term durability). This project aims to:

- Identify and characterise suitable UK clay materials sources available at a scale sufficient for mainstream use in cement and concrete (and locations).
- Assess calcining conditions (temperature, time) and their effects on reactivity of clays
- Establish the reactivity of calcined clays, effects on fresh concrete behaviour and long-term properties (durability, strength, microstructure) - including mechanisms. Benchmark against reference materials (fly ash).
- Look at costs, feasible levels (%) of addition and environmental benefits (CO<sub>2</sub> savings).
- Prepare a detailed cost-benefit analysis of adopting calcined clays as SCMs.

The approach adopted will be to identify material sources, secure samples, understand the mineralogy and assess availability, calcine the materials and prepare laboratory mortar and concrete specimens for study. Tests of the fresh concrete/mortar and physical testing (e.g. strength) on hardened material will be developed/applied. Microstructure and mineralogical analysis will be used to establish mechanisms of strength development and durability performance.

### Liverpool John Moores University

#### **‘Live’ BIM – real time Building Information Management”**

The overarching goal of this research project is to develop a framework that combines sensors, sensor networks, Building Management Systems (BMS) or Building Control Systems (BCS) with Building Information Models (BIM), to generate a ‘Live’ BIM that enhances occupants’ health, safety and comfort, and minimises the long-term operating costs of the building.

Stemming from this goal the project aims are to:

- Study, explore and develop the role of embedded sensors in buildings, and how these can inform building management.
- Research the opportunities to use live data to inform and update BIM models.
- Research and develop data capture and protocols which can be used as live input data to BIM models.
- Implement a sensor network, data capture and analytics with an existing building and BIM model.
- Create an approach, platform and protocols to allow live data to influence, inform and update BIM models.

#### **“Digital Built Environment and Big Data”**

The overarching goal of this research project is to study, explore, develop and document the role of embedded sensors over the entire lifecycle of buildings, to enhance the congruency between design intent and its delivery and operation, improve post-occupancy performance, and reduce the capital and operating costs of buildings.

Project aims:

- Study, explore and develop the role of embedded sensors in buildings over their entire lifecycle.
- Research the opportunities, drivers for, and role of embedded sensors in materials/building applications.

- Research the opportunities for, and role of person-based sensors, and how these link to the built environment.
- Identify how data capture from buildings and users can be interpreted and used to inform decision making, automatically or manually.
- Explore the role of 'big data' in person and building-based sensor technology.
- Demonstrate the development of this work in a virtual and/or physical environment.

Regular updates on these studentships and the rest of the programme will be presented in further reports.

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## University of Edinburgh - Update

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### Developing a Fire Resilience Assessment Methodology for the Built Environment - Vasileios Koutsomarkos

This PhD research was initiated as BRE is seeking to create a methodology to assess, categorise, and identify improvements to buildings based on their resilience to fire events.

This project aims to provide the research to support this methodology; to capture and refine an overarching framework for the Fire Resilience Assessment Methodology. It will be conducted by undertaking consultation with BRE and associated stakeholder groups; performing a gap analysis of the areas of knowledge required to support the methodology, and implementing the overarching Framework.

This will use an exemplar project/building and investigate the most critical knowledge areas required to support the implementation of the Fire Assessment Method (FRAME).

As BRE has already conducted extensive consultation on the proposed Fire Resilience Assessment Methodology; the first step of the project will be to capture this consultation and the current-thinking at BRE.

During Q1 2018, Vasileios Koutsomarkos started work on the subject following a move to the UK in late April, and successfully matriculated at the University of Edinburgh (UoE).

In the first few weeks, guidance was provided by Vasileios's principal supervisor Dr Angus Law, and induction by the Chief Technical Officer Michal Krajcovic at the UoE Fire Lab's equipment.

For the duration of four working weeks (14 May to 8 June 2018), Vasileios visited BRE in Watford along with other members of the BRE Centre for Fire Safety Engineering. During that time, initial meetings took place with Raman Chagger, Dr Roger Harrison and Dr Debbie Smith that consisted of knowledge sharing and laying the foundations and directions of the project. According to Vasileios, "Fruitful experience and knowledge have been acquired through my time spent at the BRE Burn Hall for a University's experimental project. Whilst at BRE Watford, I attended the BREEAM Awareness Course provided by the BRE Academy."



Edinburgh University

## University of Strathclyde - Update

The Energy Systems Research Unit (ESRU) has been active in delivering a number of large research projects funded by EPSRC and the EC in this reporting period.

BRE is a co-participant in one of these projects – hit2gap.

ESRU has supported the commercialisation of BRE of monitoring and simulation services using solutions emanating from ESRU research. This knowledge transfer has created new income streams for BRE with good potential for then to increase in future.

ESRU is also supporting BRE bids to local authorities related to city mapping, indicating low carbon deployment opportunity and building stock modelling, both to support: energy policy formulation, energy conservation initiatives and energy systems design. These activities are likely to come to fruition in the new term.

The Centre has supported BRE USA activities at UC Davis, addressing market development for BREEAM. The inputs has contributed to the growing collaboration between UC Davis and BRE.

### Annual review

On the 13<sup>th</sup> June, ESRU hosted a visit by Deborah Pullen, Vicky Brown, David Kelly and Lori McElroy to review activities from the last year and plans for the next 12 months. During this meeting a new agreement for future collaboration was signed by BRE and the University of Strathclyde.

At the visit, a session was also organised where BRE staff could discuss new and existing work with some of the PhD students funded by the Trust.

Holders of BRE Trust Studentships have demonstrated good progress in this quarter, with two PhD completions, one scheduled viva and relevant publications. Currently, four students are being funded by the Trust – their progress is briefly summarised here:

- Valentina Bonetti is currently testing software developed in previous months to assess the effect of low exergy technologies in the built environment. She is finishing a manuscript to report on her work in a peer-review journal.
- Ciaran Higgins defined the structure of his research, which addresses strategies for future cities to ensure energy resilience using demand side management. The next period will be dedicated to iterative prototyping of solutions to account for resilience in performance assessment.
- Donagh Horgan worked on two publications in the last quarter, one accepted conference paper and one journal paper to be submitted in the next quarter. He also conducted field data collection focused on testing the sustainability framework he developed.
- Ioanna Vrachimi submitted a journal and a conference paper in the period, reporting her achievements in embedding machine learning in building simulation to improve stock modelling capabilities. In the next period, she will expand her work to cover other physical phenomena, e.g. convection and wind-driven rain.
- Maddalena Iovene delivered her thesis and will have her viva in the next quarter.
- Maria Bocanegra-Yanez and John Allison, previously supported by the BRE Trust, successfully defended their dissertations and graduated in the last quarter.



# Appendix A: Project Status

## People

### Research

- Fire Protection: Digital Technologies & Personal Wellbeing. **Trust Contribution** - £28k. **Other Contribution** - £80k. **Status** – In Progress
- Life-long health effects of poor indoor air quality. **Trust Contribution** - £15k. **Other Contribution** - £140k. **Status** – In Progress

### Demonstration & Dissemination

- Home for Life. **Trust Contribution** - £15k. **Other Contribution** - £135k. **Status** – Completed

## Property

### Research

- Suppression of Biomass Fires. **Trust Contribution** - £12.5k. **Other Contribution** - £40k. **Status** – In Progress
- Centre for Smart Homes. **Trust Contribution** - £53.5k. **Other Contribution** - £81k. **Status** – In Progress
- Circadian lighting effects on health and wellbeing & Solar shading. **Trust Contribution** - £35k. **Other Contribution** - £45k. **Status** – In Progress
- 3 Resilience- Tackling overheating in urban dwellings. **Trust Contribution** - £40k. **Status** – Postponed until early 2018/19
- Optimum replacement of detectors. **Trust Contribution** - £30k. **Other Contribution** - £37.5k. **Status** – In Progress
- Lancaster Grange: Living Legacy. **Trust Contribution** - £15k. **Other Contribution** - £25k. **Status** – In Progress
- Investigation of the use of TGA for fingerprinting analysis on insulating foams. **Trust Contribution** - £12.5k. **Other Contribution** - £3.5k. **Status** – In Progress

### Demonstration & Dissemination

- BIM Case Studies. **Trust Contribution** - £24k. **Other Contribution** - £46k. **Status** – In Progress

### Skills & Learning

- Disseminating knowledge through digital training. **Trust Contribution** - £40k. **Other Contribution** - £20k. **Status** – In Progress

### Studentship

- Live BIM! - Real Time Building Information Management. **Trust Contribution** - £30k. **Status** – In Progress
- Calcined clays as a reactive alternative to fly ash as a binder in Portland cement concrete. **Trust Contribution**- £33k. **Status** – In Progress

## Places

### Demonstration & Dissemination

- Building Resilience to Natural Disasters. **Trust Contribution** - £12k. **Other Contribution** - £145k. **Status** – In Progress

### Studentship

- Digital Built Environment and Big Data. **Trust Contribution** - £30k. **Status** – In Progress



## Appendix B: Current Studentships

<b>People (Health, productivity, safety and wellbeing)</b>
Hybrid coupled modelling of heat and smoke movement through complex buildings, Ben Ralph, University of Edinburgh
Modelling indoor environmental quality in low energy housing, Maria del Carmen Bocanegra-Yanez, University of Strathclyde
Measuring and modelling overheating in domestic buildings, Kostas Mourkos, University of Loughborough
<b>Places (community resilience, climate affects)</b>
Social innovation systems for building resilient communities, Donagh Horgan, University of Strathclyde
Holistic and semantic decision and policy-making model for resilient and sustainable urban infrastructures, Giulia Cerè, Cardiff University
Development strategies for future cities to ensure energy resilience, Ciaran Higgins (Part time), University of Strathclyde
Eco-cities – Towards energy positive districts enabled by BIM Level 3 Semantics, Corentin Kuster, Cardiff University
Future City Transport Strategy Development, Konstantina Bimpou, University of Strathclyde
Digital Built Environment and Big Data – Student TBC – Liverpool John Moores
Improving overheating risk assessment procedures in urban dwellings – Student TBC – Loughborough University
<b>Property (efficiently and sustainably, resource efficiency, further proof, house quality)</b>
Low cost approach for characterization of Residential Building stock for energy labelling, Ioanna Vrachimi, University of Strathclyde
Bringing big data into building energy modelling - building energy focused geodemographic classification, Steven Zhang, Loughborough University
Dynamic energy analysis for the built environment, Valentina Bonetti, University of Strathclyde
Ignition of solid fuels exposed to transient incident heat fluxes, Simon Santamaria, University of Edinburgh
Embedding a circular economy in the building sector, Katherine Adams, Loughborough University
Traceability in the construction supply chain (productivity), Asselya Katenbayeva, Loughborough University
Flood resilience: Improving building drying times, Fiona Gleed, University of Bath
Real-time and semantic energy management across buildings in a district configuration, Jonathan Reynolds, Cardiff University
Smart Meter Data Analytics for Efficient Energy Management, Anthimos Ioannidis, University of Hertfordshire
Whole-Timber Structural Systems, Aurimas Bukauskas, University of Bath
Next generation natural fibre reinforced geopolymers, James Bradford, University of Bath
Optimising phase change material use for energy- efficient buildings, Ahmad Wadee, University of Bath
Automatic Generation of BIM Models by Semantisation of Building Data, an application in the energy retrofitting domain, Matthew Courtney, Cardiff University
Building Energy and Environment: measurement, data, analysis and interpretation – Student TBC – Loughborough University
Calcined clays as a reactive alternative to fly ash as a binder in Portland cement concrete – Student TBC – Coventry University
Blockchains for traceability assurance – Student TBC – Loughborough University
Live BIM' - Real Time Building Information Management – Student TBC – Liverpool John Moores
Developing a Fire Resilience Assessment Methodology for the Built Environment - Vasileios Koutsomarkos

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**BRE Trust**

The BRE Trust uses profits made by BRE Group to fund new research and education programmes, that will help it meet its goal of 'building a better world together'.

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