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The way we construct and manage homes, workplaces and other built assets can have hugely positive impacts on our wellbeing, economic performance, and the sustainability and resilience of our built environment.

To realise these benefits we must be able to react and adapt to challenges such as extreme weather events, fire and globally disruptive forces including climate change and the COVID-19 pandemic. Critical to this – and the BRE Trust’s core focus – is the development of improved products, processes and tools to enhance economic and environmental impacts.

Over the last 20 years the Trust, its subsidiaries and delivery partners, have expended many hundreds of millions of pounds to extend the skills needed to adopt new knowledge and innovation to address these built environment challenges.

Our current strategy, which was launched two years ago, builds on this success to increase the outcomes and impacts of the programme even further. This has been achieved by focusing on the themes of wellbeing, sustainability and resilience.

In the last year a growing number of partners from public, private and academic organisations have aligned their resources and activities to form collaborative delivery clusters. We have extended our outreach through wider engagement, particularly with the teaching organisations and charities who are already demonstrating successful societal value. This has increased both pace and scale of application of the new knowledge created through our programmes.

We are also working together to find better ways to measure impact and share good practice and experience of this with others – it’s going to take us all to address global and local challenges efficiently.

I’d like to thank our partners for their continued efforts to deliver work of the highest quality and relevance at a time when funding and resources are at a premium for everyone. I’d also like to thank my fellow Trustees for their continued support in ensuring that the BRE Trust achieves its strategic objectives.

**Sir James Wates CBE**
Chairman, BRE Trust
Programme performance and impacts

The BRE Trust programme has had another busy year creating new data and information relevant to the built environment. Our focus on the particular themes of wellbeing, sustainability and resilience has resulted in growing delivery clusters with other organisations. This also includes charities who operate in the built environment to both inform and utilise the outputs of our projects. These partnerships are already giving us better insight into successful approaches to increase social value and opportunities for extend this through new knowledge and skills. New training packages and other learning material both in formal teaching and as part of CPD will continue to be a priority for future outputs from our programme.

Particular focus has also been placed on extending our outreach to increase the dissemination and we have now grown our distribution network to over 170,000. This has resulted in increasing access to online content, with the launch of our Knowledge Hub and continued use of other platforms such as designingbuildingswiki. Review and downloads of this information has grown by over 50% in the last year, together with a 75% increase in citations and tagging by third parties who also recognise the value of this information to them and their communities.

The ultimate societal impacts are achieved through the application of new knowledge and skills by a growing network of third party organisations and we continue to work together to qualify and extend this going forward.

I have a small but dedicated team who work with me to continue to make our programme a success for the Trustees and the communities that we support. For that I thank them.

Dr Deborah Pullen MBE
Executive Director, BRE Trust

Inputs
- BRE Trust funding £860k, £900k other cash and in-kind
- 68 people actively delivering projects
- 29 other organisations involved
- 11 studentships and 5 university staff roles supported
- 170,000+ distribution network

Outputs
- 9 projects completed, creating 11 new data sets, algorithms or test methods
- 13 events held, attended by 1100+ people
- 1 new training modules launched
- 75 new peer-reviewed publications
- 35 reports, articles and videos released

Outcomes
- 3 PhD students and 139 graduates from supported training courses
- 24 other events supported, attended by 2430 people
- 1,500 publications sold
- 150,000+ online downloads
- 3,500+ citations of online reports by 3rd parties
- 270,000 3rd party tags of web postings

Societal Impacts
- Reduce loss of life and property through fire
- Reduce carbon emissions and other environmental damage
- Support independent living and health
- Optimise the use of natural resources
- Improve wellbeing in indoor environments
Our partners

The BRE Trust is building a network of like-minded organisations to improve research, education and practice in the built environment. We work with our partners – such as those listed below – to:

▲ maximise social value by increasing our understanding of the issues and knowledge gaps,
▲ develop resources to educate students, built environment professionals and communities,
▲ facilitate partnerships between organisations in different fields to expand the scope and impact of projects,
▲ leverage additional funds through our network to benefit all partners.

**Redevco Foundation** – The Foundation is providing additional funding to help us extend the development and use of Qsand, and to develop a tool that supports more sustainable retrofit.

**Article 25** – We are supporting research and dissemination of Article 25’s valuable work to improve practice across the humanitarian architecture community.

**Catholic Relief Services** – CRS is our main humanitarian sector partner using Qsand in the field. We are expanding this work to support training and promote good practice in disaster response.

**Autistica** – We are building a new partnership to support autistic people and their families, with an initial project on understanding the impact of the built environment on office working.

**Chan Cheung Mun Chung Charitable Fund** – Through this partnership we have been working with several organisations based in Hong Kong and mainland China, to support improved health and sustainability in rural housing and construction projects.
University Partnerships – The BRE Trust supports research and teaching through a network of leading universities, providing bursaries and scholarships to staff and students to ensure the skills of our professionals are relevant for the future. We are currently supporting two Chairs, one lectureship and 11 studentships.

- **University of Edinburgh** – The Trust supports the BRE Chair and a number of studentships in the Centre for Fire Safety Engineering, which conducts multi-disciplinary research and teaching in a critical field that protects people and properties in the built environment.

- **Loughborough University** – We are supporting a Royal Academy of Engineering Fellowship to enhance affordable, reliable and sustainable energy for rural communities. Studentships in the School of Civil Engineering are also focused on energy efficiency and block chain technologies.

- **University of Bath** – The Trust is supporting the BRE Chair and studentships in the Centre for Innovative Construction Materials, and working with the Healthy Housing for the Displaced Team, looking at ways of improving shelters in refugee camps.

- **Coventry University** – The Trust is supporting a studentship focused on reducing the carbon emissions of concrete for use in construction.

- **University of Hertfordshire** – The Trust is supporting a lectureship in the Dept of Civil Engineering, and shares the delivery of BEng and MEng courses to extend future professionals’ knowledge.
High quality living and working environments are essential for good physical and mental health. We are focusing on the key issues of indoor environment quality, independent living and fire safety.

We spend 90% of our lives in buildings and over 50% of office staff lack sufficient daylight access. Improving indoor light, noise and air quality conditions, and reducing overheating, damp, cold and pollution is critical to improving people’s health and productivity in the workplace. With the growing trend, and now often requirement, for working from home, it is important to ensure that these issues are also addressed in the home work space.

Trust supported studies include those to understand the causes of fire deaths and serious injuries, and to reduce the false fire alarms which cost over £1 billion annually in the UK.

Creating positive spaces

Designing and managing workplaces that have a positive impact on health, wellbeing and productivity is not easy, but most organisations, designers and developers don’t gather feedback on their buildings to find out how well they are performing. Issues impacting on staff and business – and how to address them through building design and operation – are therefore often missed.

Pre-and post-occupancy evaluation (POE) is a tried and tested means of gathering evidence to measure how existing buildings, or completed new build and refurbishment projects, are performing. It combines physical measurements, such as monitoring the indoor environment, energy and water consumption, with occupant responses gathered through workshops, interviews, observations and case studies.

The BRE Trust has supported a project by Oliver Heath Design and Interface to develop a guide on Creating Positive Spaces by Measuring the Impact of your Design, for which BRE has provided the technical content.

This practitioner’s guide describes the POE process and its benefits, advises on how to get started and illustrates the process with case studies. It is freely available.
A new virtual reality health and safety training tool uses digital technology to assess needs, and track and improve performance.

**Health and safety training ‘game’**

A virtual-reality tool that delivers training to improve construction health and safety is being developed by Dr Zulfikar Adamu of Southbank University. This work has received support from the Royal Charter International Research Award, of which Dr Adamu was a co-winner. The Award is funded by the BRE Trust and the Worshipful Company of Constructors.

Trainees using the tool are ‘players’ in a virtual-reality, health and safety training ‘game’. The tool includes a psychometric test to assess each trainee’s personality traits. The virtual reality experience is set in a construction workplace with a range of hazards (such as, falling equipment, fire and working at heights), adapted to the player’s particular personality and training needs.

Other variables include changing weather conditions, and equipment and tools – so the player’s ability to, for example, work safely on scaffolding on a windy day can be tested and lessons learned. Health issues such as dust and vibration, and the player’s ability to deal with these, can also be included.

Dr Adamu explains the tool and the next steps in its development in a freely available video on the BRE Trust Knowledge Hub.

**Standards needed for IAQ monitors**

Maintaining good indoor air quality (IAQ) relies on continuous monitoring, but as the quality of the growing numbers of sensors and monitors available is variable, a robust means of testing them is needed.

BRE Trust supported research has developed a test protocol to investigate the performance of various commercially available VOC and CO₂ sensors/monitors, when challenged by realistic levels of these pollutants.

Demonstrating a wide variability in the quality of performance, this research has helped to underline the very real need for standards for air quality monitors.

30 fatal injuries to construction industry workers (RIDDOR 2018/19), and 54,000 non-fatal injuries. (LFS, estimated annual average 2016/17-2018/19).

Respiratory problems in children can be made worse by indoor air pollution.
Call for action on indoor air pollution

Growing evidence that children’s respiratory problems can be made worse by indoor air pollution has highlighted the need to improve indoor air quality (IAQ), says a report from the RCPCH (Royal College of Paediatrics and Child Health) and the RCP (Royal College of Physicians).

“I was very happy for the BRE IAQ team to participate (with BRE Trust support) in this crucial and timely report,” said Dr Andy Dengel, Director, BRE Environment.

The report provides a review of indoor pollution research, evidence from practitioners, and conversations with children, young people and families. It gives evidence linking pollution with childhood health problems such as asthma, wheezing, conjunctivitis, dermatitis and eczema.

“In children and young people, the effects of poor IAQ can be more marked due to respiratory and other bodily systems still being in development,” says Andy Dengel. “Now, as called for in the report, it is time for urgent action by many parties.”

The Inside story: Health effects of indoor air quality on children and young people is freely available.

Circadian lighting research results

Research to assess circadian lighting and give guidance to building owners and lighting designers, manufacturers and installers, is summarised in a BRE Trust report.

Light helps to maintain circadian rhythms – physical, mental and behavioral changes that follow a daily cycle. Recently, circadian lighting has been marketed to improve alertness during working hours using bright light, switching to lower-brightness, warmer-coloured light before relaxation time.

The BRE Trust supported study, carried out in a university office, set out to translate experimental knowledge on the effects of workplace lighting into real-world good practice. The responses of the office workers to their existing, constant fluorescent lighting were compared with those to various new dynamic LED systems.

Lighting for circadian rhythms, is freely available on the BRE Trust Knowledge Hub.

It has helped to underline the very real need for standards for air quality monitors.

“It in children and young people the effects of poor IAQ can be more marked.”
Dr Andy Dengel, BRE
Data is the fuel driving improvement in the built environment. Supported by the BRE Trust, the use and dissemination of national house condition survey data, for example, has shed light on poor housing conditions in the UK and provided vital support – often in combination with health impact data – for better housing campaigns.

A rare snapshot of UK housing

The UK’s housing stock is the oldest in Europe – probably the world – and is only very slowly being replaced. Older homes are often difficult to make healthy, safe and suitable for the future.

Housing condition surveys provide the data needed for targeted and costed housing policies for delivering better homes.

Surveys in the four UK nations are conducted separately, but the key information that each uses to describe housing is comparable. In 2017 the four surveys were – for the first time in nine years – all being conducted during the same year.

This presented an opportunity to combine their findings into a single BRE Trust supported report, *The Housing of the United Kingdom*. It gives UK-wide information on issues such as dwelling age, type, construction and condition, energy use and the cost of poor housing.

The report is freely available on the BRE Trust Knowledge Hub.

“The BRE survey and analysis of housing condition is invaluable…this solid data underpins our work programmes, including targeted action to improve homes as well as related profile raising, and campaigns for wider housing policy change.”

Sue Adams CEO, Care and Repair England

The UK’s diverse housing stock represents a long history of housebuilding, with local preferences, materials and policies.
100 years of council housing

Last year was the 100th anniversary of the 1919 Housing Act which introduced ‘council housing’ to the UK. It also led to the creation of the Building Research Station – now BRE.

In partnership with the Ministry of Housing, Communities and Local Government, BRE is producing a BRE Trust report on ‘100 Years of Council Housing’. It will describe the changing face of social housing and the people who live in there, and consider: Who is our future council housing for and what should it look like?

This analysis of council houses and the people who live in them (using English Housing Surveys and other data sources), will reveal how they have changed over time, and the housing type that has been most successful. It will support a fundamental principle of the BRE Trust, which is that better housing equals better health and wellbeing and a better built environment.

The BRE Trust supports fire safety research that delivers fundamental knowledge with practical impacts on everyday life.

Fire deaths and serious injuries

Fire experts are reviewing data gathered by fire and rescue services to investigate the causes of fire deaths and circumstances of serious injuries. The findings will support guidance on using new technologies or services to reduce fire death and injury in homes.

In the project’s first phase, factors contributing to typical fatalities and serious injuries have been studied and fourteen recommendations proposed for reducing them. The next phase will focus on the details of each of the review period’s 126 fire fatalities and, in light of these, assess the effectiveness of these recommendations.

More information is available on the BRE Trust Knowledge Hub.

“… better housing equals better health and wellbeing and a better built environment.”

The BRE Trust

Scottish Fire and Rescue Service (SFRS) engaging with the community to identify fire safety risks and measures to reduce them. Photo: SFRS.
UK fire fatalities have steadily declined over the last three decades, but since 2012 the decline has plateaued, standing at around 340 fire deaths in 2017/18.

How long before replacing smoke detectors?

UK codes and regulations have no recommendations for when smoke detectors should be replaced, but with time their components become dusty and electrical components degrade.

A BRE project is testing smoke detectors to identify the impact of age on their sensitivities and propose replacement periods. This will enable UK codes and guidance to be updated.

More information on this and other BRE Trust supported fire safety research projects is available on the Knowledge Hub.

The Trutest detector sensitivity tester being used on-site to get an alarm response from a commercial smoke detector.
Improving fire safety design

The use of coupled hybrid modelling for fire safety design in buildings has been investigated by Benjamin Ralph through a BRE Trust supported PhD at the University of Edinburgh.

Fire engineers often use CFD-based fire modelling to develop and test complex building designs. But as this type of simulation takes an impractically long time to run, engineers typically reduce the model size. A smaller model, however, may not account for the entire building, so limiting the development of robust fire safety solutions.

Coupled hybrid modelling combines the original complex model and another which takes a much shorter time. Fire engineers can thereby increase the model size to include more or all of a building, but still carry out a simulation in an acceptable time.

A summary of this study is available on the Knowledge Hub.

Fire Safety Engineering

The BRE Trust supports the BRE Chair and a number of studentships in the University of Edinburgh’s Centre for Fire Safety Engineering, which conducts multi-disciplinary research and teaching. Trust supported PhD studies currently include projects on:

- A fire robustness index for buildings by Vasileios Koutsomarkos,
- Testing for knowledge: maximising information obtained from fire tests by using machine learning techniques by Arjan Dexters. Work on this study was presented at Interflam 2019 in London,
- Predicting the fire behaviour of innovative construction materials by Simon Santamaria.

This year the Centre members have remained active in committee and standardisation work related to cladding materials and British Standards updates (e.g. BS 8414 and BS 9414).

BRE Chair, Grunde Jomaas, gave an invited lecture on the topic of ‘Fire Safety on Roofs with Photovoltaic Installations’ at a conference hosted by IIT, Kanpur in India.

Full details of the Centre’s work are at www.fire.eng.ed.ac.uk.

“The overall experience and opportunity has been priceless, and I have learnt so much. I now aim to continue expanding my knowledge and learning new skills to help society become safer and more sustainable.”

Benjamin Ralph, Head of Fire Safety, Foster + Partners
There is a great opportunity to improve our built assets and the efficiency of their construction and operation, while delivering a more sustainable environment and economy. We are focusing on aspects of environmental performance, affordability and operational efficiency.

The global population will grow by 30% to 9.8 billion by 2050, with a 2.5 billion increase in urban settlements and 3 billion in slums (compared with 1 billion now). More than 1 billion new homes are needed, mostly in developing countries. This makes more affordable and sustainable solutions a priority, including access to materials, assembly, manufacturing processes and design.

Concrete accounts for 1 billion tonnes of CO₂ pa but this could be reduced by more than 30% using alternative mixes and reusing waste aggregate. Forests absorb CO₂ emissions, but currently more than 50% of felled wood is burned instead of used in construction.

**New PhD – Using clay in low-carbon cements**

The use of calcined clay in low-carbon Portland cement – as a reactive alternative to fly ash as a binder – is being investigated by a full-time BRE Trust PhD studentship in partnership with Coventry University.

Awarded to Kwabena Boakye, currently at the Building and Road Research Institute in Ghana, the project will examine the availability, mineralogy and chemistry of UK clays, their properties and potential use in cement to produce mortars and concretes. It will consider the sustainability, role in carbon footprint reduction and performance in service environments of such materials.

Kwabena Boakye is investigating the use of clay in low-carbon cements.
Retrofitting energy efficiency

Poor design and installation of energy efficiency measures (EEMs) when refurbishing homes can limit energy and cost savings, and increase moisture, air quality and other problems.

As part of the government target to improve the EPC rating of all homes to Band C by 2035, insulation and heating systems have been installed in 1.8 million low-income and vulnerable households. But concerns about the design and installation of these measures has led to the development of PAS 2035 technical standard for the installation of EEMs. Key to this is training for those delivering these measures.

The BRE Trust has funded a series of training videos to raise awareness of key technical refurbishment topics. These videos are consistent with PAS 2035, and are available from the BRE Academy.
Waste product in affordable, sustainable housing

Affordable and sustainable housing is urgently needed in developing nations with rapid population growth. Fired-clay brick homes may offer a better quality of life than traditional materials, but have higher financial and environmental costs.

Cement-stabilised earth blocks (CSEB) provide a cheaper and ‘greener’ alternative. They are made of soil, with Portland cement for durability, manually compacted and cured in atmospheric conditions. Although small, the cement component dominates the blocks’ cost and environmental impacts.

Dr Alastair Marsh of the University of Leeds is investigating the use of rice husk ash to partly replace cement in CSEB. Rice is an important crop in Uganda, where the husks are either discarded or burnt in incinerators to generate heat – producing ash waste.

This project is being part-funded through the Royal Charter International Research Award for Young Constructors, which is sponsored by BRE Trust and the Worshipful Company of Constructors.

Dr Marsh is providing video progress updates, available on the BRE Trust Knowledge Hub.
Waste management modelling

Building information modelling (BIM) is commonly used in designing and constructing buildings, but seldom in their operation and management.

Research led by Dr Ricardo Codinhoto at the University of Bath has investigated the use of a BIM-based model in managing operational waste.

This project was part-funded through the Royal Charter International Research Award for Young Constructors, which is sponsored by the BRE Trust and the Worshipful Company of Constructors.

The University of Bath has 118 buildings, 20,000 occupants and annual waste generation (general and recyclable) of 280 tonnes. It was used by the project team to represent a mini-city, in which the flows of people, waste and waste services, and the geometry of the buildings could be modelled and their interconnections examined.

The aims of the work included finding ways of improving the efficiency of waste collection, and of identifying waste generation ‘hotspots’ where interventions could most effectively be made to reduce waste.

Dr Codinhoto explains the project in video available on the Knowledge Hub.

Building of the future

The five winners of the University College of Estate Management ‘Building of the Future’ competition, were hosted by the BRE Trust for a day of activities at BRE’s Watford site in October 2019.

Aged between 12 and 16 from schools across the south east of England, they had each designed an innovative sustainable building to address future built environment problems. These included an eco-school and an underwater family home. During their visit the children were given insights into the many ways BRE tackles sustainability.

“It was great to receive the WCC/BRE Trust award. It enabled me to start testing a promising idea I had, which otherwise would have been just another unexecuted vision.”

Dr Ricardo Codinhoto, University of Bath

“Amelie attended the ‘Building of the future’ day today and she hasn’t stopped talking about it! Thank you so much for giving her this opportunity, for inspiring her and for sparking her interest in innovation and sustainability. I’m sure this will stay with her forever and may well guide her career path in future.”

Amelie’s Mum
New BRE Trust lecturer

Gabriel Barros do Santos has been appointed as BRE Trust Senior Lecturer in Civil and Structural Engineering at the University of Hertfordshire. The Trust is supporting the University in its delivery of new BEng and MEng civil engineering courses for a three-year period.

This will extend the University’s capacity in teaching and student research in civil engineering, to ensure that graduating students have the knowledge and skills needed to meet industry needs.

Innovative Construction Materials

The BRE Trust is supporting the BRE Chair and studentships – on topics including fibre reinforced geopolymers and self-healing concrete – at the University of Bath’s Centre for Innovative Construction Materials.

The Centre hosted the 39th Cement and Concrete Science Conference in September 2019, attended by over 100 international delegates.

The outputs from the completed EU-funded project Sustainable Bio & Waste Resources for Construction can be found on the Iterreg website.

The first report from Absolute Zero, led by Professor Tim Ibell, was debated in the House of Lords.

Full details of the Centre’s work are on the Bath University website.

Current PhD projects

The BRE Trust provides funding for an extensive range of PhD studentships on sustainability and associated topics, including:

- Characterising building stock for energy labelling by Ioanna Vrachimi, University of Strathclyde.
- Building energy and environment: measurement, data, analysis and interpretation by Daniel Franks, Loughborough University.
- Tracking and tracing construction products – the potential of distributed ledger technologies, by Alistair Wilson, Loughborough University.
- Optimising Phase change material use for energy-efficient buildings by Ahmad Wadee, University of Bath.
- The next generation natural fibre reinforced geopolymers by James Bradford, University of Bath.
- Self-healing concrete by Lorena Skevi, University of Bath.
Our built environment must be able to adapt to – and mitigate against – social and environmental pressures caused by local and global changes. We are supporting work in the areas of home adaptation, adapting for climate change, and community development.

More than 50 million people globally are affected by flooding and in the UK alone this is set to rise to 2 million by 2050. We support innovations that allow built assets to respond to changing external influences and threats, including flooding, temperature change and other natural hazards. For every $1 spent on building resilience and preparing for disaster, $4 are saved in recovery.

Currently, there are an estimated 50 million environmental refugees (people displaced by environmental causes) each year. This number is expected to triple to 150 million by 2050. 80% of houses rebuilt after disasters are rebuilt by inhabitants with little or no input from builders, engineers or architects. Aiding the development of supply chains that will deliver the homes and other buildings and services needed in informal and low-income communities is a priority.

Despite a greater level of humanitarian funding in 2017 than ever before, the global humanitarian system is still only able to meet around 60% of global humanitarian need. So supporting humanitarian and development organisations engaged in reconstruction in vulnerable communities, and rebuilding livelihoods following traumatic events is also a priority.
Property flood resilience Code of Practice

Record flooding levels again caused distress, damage and economic loss in the winter of 2019/20, further emphasising the need to make the UK more flood resilient.

Following the storms of 2015/16, a government Roundtable produced the Property Flood Resilience Action Plan for increasing the UK’s flood resilience, which included demonstrating what good flood resilience practice looks like.

With the support of the BRE Trust and partner organisations, the Flood Resilient Repair Demonstration House was created on BRE’s Watford site. The experience gained in designing and implementing the house helped BRE to become a source of good practice expertise in property flood resilience. This has fed into other projects including a CIRIA Code of Practice (CoP) for Property Flood Resilience, for which BRE was appointed as authoring team lead.

Published in December 2019, the CoP is concerned with resilience measures that can be installed as part of the repair of buildings after they have been flooded, and also in anticipation of a flood by property owners wishing to be proactive.

The BRE Trust Knowledge Hub has details on the Flood Resilient Repair Demonstration House.

...around 5.2 million properties in England, or one in six properties, are at risk of flooding.

Environment Agency
Measuring dementia adaptations

When a dementia-friendly demonstration house was developed on BRE’s Innovation Park, 12 factors common in most housing were identified as having both negative and positive effects on someone living at home with dementia.

The BRE Trust has supported a further study of the influence of these factors on building performance. This has been used to develop a method of assessing the effectiveness of measures to support those with dementia, and a way of creating consistency in adapting buildings for dementia.

A home adaption guide methodology and a scoring mechanism have been developed and ‘road-tested’ in two pilot projects. They will give consistency and credibility to the adaptation of buildings and will be applicable to all properties.

More information visit the BRE Trust Knowledge Hub.

Adapting with age

The Adapting with Age team at the National Housing Federation’s Creating Our Future programme works to tackle the issues faced by an ageing population, with a focus on helping people to live well and longer in their own homes. Currently 68% of those aged 75+ currently live in homes with no adaptation to suit their needs.

To support this work, the BRE Trust funded the BRE Housing Centre to access national housing survey data to provide Adapting with Age with information on the presence of home adaptations. This included the number of:

- properties that have grab rails installed,
- properties without level access,
- properties with a bathroom adapted for disabled people,
- older people and those with a long-term limiting illness that had grab rails, level access or a bathroom adapted for disabled people.

Visit the BRE website for more information on housing surveys.

PhD projects

Resilience themed PhD studies supported by the BRE Trust include the following at the University of Strathclyde:

Buildings resilient communities by Donagh Horgan – producing guidelines on developing and using social innovation systems and community engagement in building resilient communities.

Energy resilience in cities by Ciaran Higgins – developing a range of strategies that cities can adopt to ensure future energy resilience.

850,000 people in the UK are living with dementia. This is projected to rise to 1.6 million by 2040.

Alzheimer’s Society

68% of those aged 75+ currently live in homes with no adaptation to suit their needs.

Care & Repair England
The BRE Trust is supporting humanitarian and development organisations engaged in reconstruction in vulnerable communities, and in rebuilding livelihoods and increasing community resilience following traumatic events.

**Supporting displaced communities in Myanmar**

Work to enable displaced communities in Myanmar to build their own homes, is being supported by the BRE Trust and The Redevco Foundation with the use of the QSAND sustainability and resilience tool.

Communities across northern Myanmar have been devastated by internal conflicts. After an outbreak of violence in 2011, around 100,000 people were displaced within the country and still live in poorly equipped camps.

Karuna Mission Social Solidarity (KMSS), the national branch of Caritas in Myanmar and the foremost local humanitarian responder to the conflict, is leading efforts to help displaced families move to new neighbourhoods and build their own homes. Catholic Relief Services is helping KMSS meet the needs of the uprooted families and communities, and with BRE Trust support will use QSAND to monitor and evaluate the project.

The QSAND tool guides the reconstruction of disaster-affected shelters and settlements, with a focus on community sustainability, long-term resilience and self-sufficiency. The Myanmar project is the first to use QSAND in a post-conflict setting, reflecting an extension of its use into wider humanitarian, development and education projects.

Further information and updates on this project are on the Knowledge Hub.

Communities are taking opportunities to design and build their own homes. Photo: CRS.
Community energy resilience

A billion people have no access to electricity, and three billion rely on traditional fuels for cooking, exposing women and children particularly to indoor air pollution and danger when collecting firewood.

The BRE Trust is supporting Dr Long Seng To’s Royal Academy of Engineering research fellowship at Loughborough University, for a project on ‘Enhancing community energy resilience using renewable energy in developing countries’. The aim is to find ways of providing affordable, reliable, and sustainable energy for rural communities.

There are examples from around the world of the contributions that communities can make to energy resilience. Over the next four years Dr To and her team will look in depth at community level approaches in Malawi and Nepal, developing measures of community energy resilience, and co-creating solutions with two communities in Nepal and two in Malawi. As a part of this project, Dr To will also examine the energy component of the QSAND tool and use this to measure the trade-offs between energy and other sustainability measures.

Keep up to date with this research by visiting the Knowledge Hub.

Post-disaster shelter

Earthquakes, floods and storms in China displace around 5 million people a year. With the frequency and severity of disasters increasing, emergency responders are looking beyond the immediate survival needs, to the longer-term wellbeing of affected communities.

The BRE Trust is supporting a student group from Beijing Jiaotong University in their development of a post-disaster housing solution to enter into the 2021 Solar Decathlon competition.

They are designing the ‘Bag Box Building Community’, a shelter that can be carried into a disaster area. It will fold out to provide emergency medical and communications equipment, and later the bags can be combined to develop transitional housing.

A QSAND assessment at the design phase of the project will give recommendations for improving sustainability and resilience. The BRE Trust will also provide technical guidance and sustainability training to the students.

Further information and updates on this project are on the Knowledge Hub.

“… a great opportunity to apply QSAND from the very beginning of a project.”

Jamie Richardson, Catholic Relief Services

1 billion people have no access to electricity.
3 billion people rely on traditional fuels for cooking.
Make Design Matter – first year report

The Make Design Matter series of monthly talks, organised by humanitarian architecture charity Article 25, brings together design professionals working to support the most vulnerable in society across the developing world.

Having provided funding for the first year of talks, the BRE Trust has committed to supporting a second year of these popular and inspirational presentations.

Reporting on the talks, Article 25 Managing Director, David Murray, said, “As we intended to raise the profile of humanitarian design, we proactively sought the support of architects, engineers and others, to host each talk. That way, we were in a position to showcase the work of that host – as well as build relationships amongst designers, engineers and the general public – whilst sharing valuable insight on each completed design & build project.”

“This is really helping to showcase the important work and impact that human-centred design and construction is having on communities across the world.”

Highlights from the 2019 talks can be viewed at on the Knowledge Hub.

“Thank you so much to all at the BRE Trust for your continued support to our charity and this important profile-raising, dissemination and promotion effort in the UK.”

David Murray, Article 25
Changing lives in Burkina Faso

Among Article 25’s humanitarian projects has been the redevelopment of Bethel School in Burkina Faso, in which pupils were overcrowded in poorly lit, hot, concrete buildings. Article 25 partnered with Giving Africa and the local mission AEAD, to build new classrooms, vocational and outdoor teaching spaces, a library, latrines and changing rooms.

Article 25 recently returned to Bethel School, with BRE Trust support, for a post-occupancy evaluation of the school. This will assess the design’s delivery of comfortable learning conditions, maintenance and repair issues, and social and economic impacts.

The results will be available along with project details on the Knowledge Hub.

Sensitive wetland development

Post-graduate students at the University of Linz in Austria are using QSAND on a project to review the redevelopment of an internationally important wetland site in Tunisia.

As part of the course module ‘Architecture as a Mediator of Peace’, students will examine the Sebkha Sejoumi area of Tunis, a large wetland habitat at risk of pollution and degradation from city growth around the area. The students will review a redevelopment approach to find a balance between ecological, social and economic issues, using QSAND to assess its sustainability aspects.

This will provide further feedback on using QSAND outside of post-disaster contexts, and demonstrate its effectiveness as an urban planning, disaster risk reduction instrument. The Trust is supporting the students with training materials and advice, and the team will be available to answer questions and receive feedback as their projects develop.
BRE Trust Annual Conference


With an emphasis on the value of partnerships and focussing on key topics, this year’s BRE Trust Conference heard prominent experts discussing their work to deliver positive and measurable impacts on resilience, wellbeing and sustainability in the built environment.

“It really is amazing what has been achieved by focusing on the right topics with the right people at the right time,” said BRE Trust Executive Director Deborah Pullen when opening the Conference. “This has resulted in an increase in the pace and scale of application of new knowledge needed to address future global challenges at a time when we hear all the time that we must meet future needs.”

Improving resilience to disasters
David Murray, Article 25

David Murray explained how humanitarian charity, Article 25, maximises the value of aid resources by consulting with a range of local people on the support needed, using local building techniques and materials, employing and training local workers, and encouraging the participation of women.

Affordable and sustainable energy for all
Dr Long Seng To, Loughborough University

While climate change, natural hazards and conflicts may cause energy supply disruptions in developing countries, the affected communities often have their own energy resilience. Dr To and her team are investigating community level approaches in Malawi and Nepal, developing measures of community energy resilience and co-creating energy supply solutions with communities.

Improving settlements in Myanmar
Jamie Richardson, Catholic Relief Services (CRS)

Jamie Richardson discussed CRS’s focus on sustainability (and use of QSAND) in emergency relief projects, and on encouraging community participation in development projects. Following the success of CRS’s approach with Rohingya refugees in Bangladesh, it has been invited to provide training and guidance for a project housing displaced people in Myanmar.

Siobhan Shaw, Senior Trusts and Foundations Manager, Autistica

“Congratulations on a fantastic event yesterday – I really enjoyed hearing about all the different projects and partnerships the BRE Trust is involved in, and we’ve definitely got some further food for thought for our own initiative. It was also fantastic to hear how keen the Trust is to catalyse partnerships and drive forward projects focused on collecting and using data.”
Use of data in the built environment
Professor Katherine Royse, British Geological Survey
Along with a revolution in data presentation, there have been key developments in making information readily accessible to users, and in focussing on the issues that concern them. This involves working with users to understand their problems, and combining data from various sources (data mashing) to effectively address an issue.

Digital modelling to support waste management
Dr Ricardo Codinhoto, University of Bath
Building design and construction teams produce large amounts of data, but at building handover little is passed on for facilities management. Dr Codinhoto described his project to investigate the use of a BIM-based model in managing operational waste in buildings, and has also explained this work in a video.

The importance of social value and how to measure it
Nathan Goode, Social Value Portal
Environmental and social governance (ESG) is a key performance metric for many of the world’s biggest investors. When measuring ESG the social value (‘S’) element is the most challenging. This is addressed by the Social Value Portal, an on-line platform allowing organisations to measure and manage the social value they generate.

Closing the Conference, BRE Trust Chairman Sir James Wates highlighted the Trust’s wish to find new partners to work with – particularly in its sustainability, resilience and wellbeing focus areas – and combine knowledge and resources. “We are keen to hear from you,” said Sir James. “Whether it be about bringing existing projects to the table, aligning some of your funding commitments to corporate social responsibility, or some other means to collaborate.”

For more information on all of the Conference presentations visit the BRE Trust Knowledge Hub.
Meet the Trustees

Trustees are invited to join the BRE Trust Council on the basis of their experience and expertise in their respective fields, and the potential of these to impact on Trust activities. They provide strategic direction to the BRE Trust and its companies.

Sir James Wates CBE
Sir James is the Chairman of the BRE Trust and has worked in the construction industry all his life. He joined Wates Construction as a management trainee in 1983 and became Chairman of Wates Group in 2013. In June 2019 he was awarded a knighthood in the Queen’s Birthday Honours for services to business and charity.

June Barnes
Formerly the CEO of East Thames Group, June is currently a Non-Executive Director of Urban and Civic plc, which is a master developer with over 40,000 new homes in the pipeline. June is also a Board Member of Hornsey Housing Trust.

Sarah Beale
Chief Executive of the Construction Industry Training Board (CITB) since January 2017, Sarah previously worked mainly in the financial sector leading on several transformational programmes, including company mergers, systems development and a variety of people and management-related projects.

Francesca Berriman MBE
Francesca became the CEO of the Chartered Institute of Architectural Technologists (CIAT) in 1995. She has more than 20 years’ experience of working in the architectural technology discipline and also has a legal background.
Ashley Hook
A chartered surveyor by background, Ashley has worked in the regeneration and housing sectors for over 30 years. He is Chief Executive of MHS Homes, which owns around 10,000 affordable homes in the Thames Estuary, and has extensive boardroom experience.

Paul Hetherington
Paul has extensive experience of building product manufacture and supply, having worked for manufacturers and merchants/distributors and been a non-executive director of the Builders Merchant Federation. Until recently he was Chief Executive of cable management solution supplier C&C Marshall.

Vicky Pope
Following a successful career as climate science researcher and programme manager at the UK Met Office, Vicky’s current roles include Trustee of Devon Wildlife Trust and In2ScienceUK, National Labs lead for AIRTO, and member of the EPSRC Mathematics Advisory Team.

Jonathan Rickard
Jonathan is a chartered architect with more than 30 years’ experience in private practice and more recently the regulated housing sector with Radian, an award-winning housing provider for which he leads the in-house construction programme.

Phil Wilbraham
Having joined Heathrow in 2003, Phil’s roles have included being accountable for the £2.5bn programme to deliver the airport’s new Terminal 2. He became Expansion Programme Director in 2017, accountable for delivering Heathrow’s third runway and the supporting infrastructure.
Structure and governance

The BRE Trust (the “Trust”) is a not for profit company limited by guarantee (Company number 03282856) and is registered as a charity in England and Wales (No. 1092193) and in Scotland (No. SCO39320). It is governed by its Articles of Association.

Objects

As a charity the Trust’s activities must at all times meet with its public interest objects set out in the Articles of Association and agreed with the Charity Commission as follows:

- to undertake, commission and support research in areas of science, engineering, information technology, management and economics associated with the built environment, including its processes and artefacts;
- to advance knowledge, innovation, and communication, and to promote education and excellence, in all such matters, and to collect, collate and publish useful information ideas, and data relating thereto; and
- to undertake, commission, facilitate such other activities and services as are beneficial to the built environment and charitable in law in accordance with the law of England and Wales provided that it will not include any purpose which is not charitable in accordance with s.7 of the Charities and Trustee Investment (Scotland) Act 2005. For the avoidance of doubt, the system of law governing the constitution of the Charity is the law of England and Wales.

Statement of public benefit

The Trustees confirm that they have referred to the general guidance on public benefit issued by the Charity Commission when reviewing on an annual basis the Trust’s aims and objectives and in ensuring that activities are defined in the Strategy document for 2017-21 and its approved annual business plan. Any benefit received by researchers and research institutes is purely incidental to the objectives of the Trust work.

Officers and Trustees of the Charity

Executive Officer

Dr Deborah Pullen MBE is the Executive Officer of the BRE Trust, and is delegated the day to day management of the Charity by the Trustees, defining and delivering the strategy and business plan and reporting on the operations of the Charity and progress in delivery of the Programmes to the Council.

Company Secretary

Mr Richard Tanner was the Secretary of the BRE Trust until 31st May 2020, providing professional advice and support to ensure the Trust meets its statutory and legal obligations. He also advised and managed relevant governance aspects of the operations of the Trust.

Governance

The BRE Trust ensures that it achieves its ambitions and aims through effective governance with the right leadership and skills. The Trust’s governance model is founded on the Charity Governance Code for Larger Charities. The Trust Council is satisfied that it applies the Code effectively.
Trustees
The governing body of the Trust is its Council which comprises up to ten Trustees at any point in time. The Trustees are also the Directors of the Company for the purposes of charity law. The Chairman is appointed by the Council of Trustees, with the current Chairman being reappointed in May 2018.

Standing Committees
At the beginning of the year the Trust Council had delegated some of its work to a number of standing committees.

BRE Trust Programmes Committee
The Committee provides for the direction and governance of commissioned research and education work. The Committee is Chaired by Francesca Berriman and attended by the Executive Officer. The Committee met three times in 2019/20.

BRE Trust Audit and Risk Committee
In July 2019 The joint Trust and Group Audit Committee was reconstituted and is responsible for finance and risk of the Trust’s operations. The Committee is Chaired by Sarah Beale and Jonathan Rickard also joined the Committee in July 2019. It is also attended by the Executive Officer.

BRE Trust Strategic Funding Committee
The Committee was launched in 2019 to develop a longer-term plan for financial growth and stability, building on the Strategy launched in 2017. The Committee is Chaired by Vicky Pope and Paul Hetherington also joined the Committee in July 2019. It is also attended by the Executive Officer.
The BRE Trust is a registered charity in England & Wales: No. 1092193, and Scotland: No. SC039320. It uses gift aid to fund research and education programmes in the built environment.