

# RISE AWARDS 2022

TORTWORTH COURT, BRISTOL

1ST SEPTEMBER 2022

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# Field and Laboratory Research

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# Field and Laboratory Research

## Highly Commended

## Effective Energy Use at Bridge Thermoplastics

Bridge Thermoplastics

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### EFFECTIVE ENERGY USE AT BRIDGE THERMOPLASTICS

**About the business**  
Bridge Thermoplastics produces uPVC profiles for a variety of sectors and customers, using recycled plastic. An expansion of the company has resulted in the production of a wide variety of custom profiles, and this has resulted in the cooling capacity of the cold-water chiller system reaching its maximum output. The site has seven different lines for producing a broad range of plastic profiles, and each line can be adapted to make a different profile. The company uses water baths that the profiles run through, and cooling water fed directly into a 'calibrator' to cool the profiles.

**Why did you engage with DE-Carbonise?**  
Bridge Thermoplastics' challenge was calculating the cooling demand to design an appropriate cooling system. Recycled PVC is used in the extrusion process for larger decking plastic. Bridge Thermoplastics has struggled over the cooling process post-extrusion for larger decking plastic.

**What has been the impact of working with DE-Carbonise?**  
In the summer of 2020, Bridge Thermoplastics engaged with the DE-Carbonise team and the City Council carried out an on-site carbon reduction audit, producing a report providing advice on reducing energy, resource efficiency and carbon emissions.

Key recommendations from this included upgrading the lighting to LED, considering solar photovoltaic panels as part of a roof replacement, and undertaking a compressed air audit.

A requirement was also identified to address the cooling needs of the business.

Bridge Thermoplastics then started working with the University of Derby to identify the maximum cooling demand from the largest profiles.

Dr. Hirbod Varasteh, a Researcher from the University of Derby, determined whether the two chillers on site could provide sufficient cooling for the target volumes of plastic production. He also analysed the data to see if there was a clear gap between the cooling capacity and the demand. Hirbod's report aimed to improve the cooling system at Bridge Thermoplastics by considering the size of the chiller, pump, and heat exchanger.

It was identified that the cooling system's bottlenecks needed to be fixed to improve efficiency and reduce carbon emissions.

Hirbod identified that Bridge Thermoplastics' cooling system had issues: the cooling tank was set at 12°C, but the cooling water temperature spiked to 16-18°C. This resulted in a reduction in production quality and production rate as well as an increase in operating costs and carbon emissions.

Although it was determined that Bridge Thermoplastics' chillers had enough capacity for most of the work planned, calculations showed that the organisation needed to have an appropriately sized pump and heat exchanger to achieve an efficient cooling system with the available chiller. Hirbod therefore recommended the best option for the cooling system design to improve efficiency and reduce carbon emissions.

The recommended options can solve Bridge Thermoplastics' issues, providing higher efficiency and the required cooling temperature with a lower pump flow rate. They have allowed Bridge Thermoplastics to schedule work more effectively so that the maximum output of the chiller would not be exceeded.

A grant administered by Tom at Derby City Council, enabled Bridge Thermoplastics to replace the heat exchangers with a larger plate model, which could be expanded easily to cope with larger cooling demands if required. The company took this opportunity to simplify the cooling pipework and upgrade the pumps.

At the same time, the grant was also used to replace all lights within the factory with LED lighting, which made a vast improvement to light levels and is forecast to save 6.5 tonnes of carbon emissions per annum. Advice from the team has also been taken to reduce compressed air use and repair leaks in the pipes, with plans to upgrade the compressors to variable speed models in the future.

**Data**

- Annual Energy Saving (kWh): 23,326
- Annual Carbon saving (KgCO<sub>2</sub>e): 6,468
- Annual Cost Saving: £2,959.00
- Value of Grant: £6,745.60

*"As a small business we wondered if we were too small to be helped, but we found that the DE-Carbonise Team was extremely helpful and able to work alongside us to consider our options."*

DE-CARBONISE UNIVERSITY OF DERBY Derby City Council DERBYSHIRE County Council derby.ac.uk/decarbonise



# Field and Laboratory Research

Winner

The CobBauge system fulfils a desperate need for a sustainable, high mass, walling material with a lower embodied energy than conventional masonry

Jim Carfrae

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# Design, Innovation and Creativity

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# Design, Innovation and Creativity

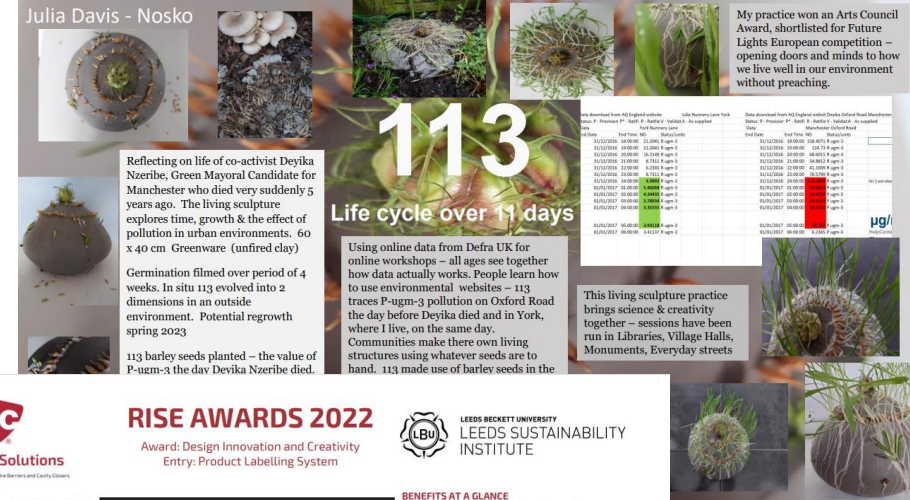
## Highly Commended

## 113 Life cycle over 11 days

### Julia Davis

## Product Labelling System

### ARC Building Solutions



**RISE AWARDS 2022**  
Award: Design Innovation and Creativity  
Entry: Product Labelling System



**ABOUT** With traceability and accountability central to the Government's new Building Safety Bill, ARC Building Solutions (ARC) has introduced an innovative new **labelling system** to its cavity barrier products.

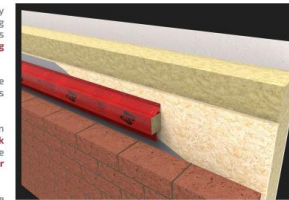
Vital **product information** and **QR codes** are now printed directly onto three of its products to support installation on site.

In the low-rise category, the labelling system has been applied to **ARC Cavity Stop Sock** and **ARC TCB** products whilst in the hi-rise category ARC's **Open State Cavity Barrier** features the new innovation.

ARC is the **first** manufacturer in the low-rise cavity barrier market to introduce this system and the **first** in the high-rise market to link QR codes directly to its own installation videos rather than hosting the information on a third-party app.

**WHY CREATED** The incorrect installation of passive fire protection solutions is an issue many customers currently face. Well-specified fire-stopping solutions play a vital role in the containment of a fire but must be **installed correctly** in order for them to perform in the intended way.

By embracing new technology and printing QR codes onto the products, ARC has been able to support customers to access easy-to-follow tutorials on the **correct handling and installation** of the cavity barrier whilst on site.



Quick and convenient, the QR codes are accessible to all and support installers to achieve greater accuracy at the touch of a button. Because the QR codes link **directly** to ARC's own site rather than being hosted on a third-party app, installers benefit from **much quicker access** to information, saving time on site.

**Traceability** and the **'Golden Thread'** of information is another new issue that customers face. Traditionally, product information such as the batch code, product code and size are printed onto secondary packaging which can get thrown away at the early stages of a project, meaning vital information is lost. Customers raised their concerns around this which prompted ARC to find a way of printing information onto the barrier itself, meaning that even when removed from its packaging or installed, it is easily identifiable.

Cherie Long, ARC Building Solutions, Gildersome Spur, Leeds, LS27 7JZ  
0113 252 9428

**BENEFITS AT A GLANCE**  
QR codes support **correct** handling and installation, preventing error and ineffective performance

Colour coding and clear product markings support **easy product identification and traceability** – even when removed from packaging

System supports **expansion** of installer knowledge

**COMPETITIVE EDGE**  
ARC is the **first** manufacturer in the low-rise cavity barrier market to introduce QR code and labelling system to its products.

ARC is the **first** manufacturer in the high-rise cavity barrier market to link QR codes directly to its own installation videos rather than hosting the information on a third-party app.

**TESTIMONIAL** "When ARC first introduced the QR codes onto their products, we realised that this was going to be of **huge benefit** for our contractors and installers. ARC already offer on-site training for our teams but the QR code gives them instant access to extended guidance.

"Search engines and product websites can often be difficult and time consuming to navigate. Having the QR codes that take you directly to specific product pages and videos really simplifies the process. Our teams are more likely to use these to access the extended guidance and for us, that helps to achieve the **correct installation**. We are looking forward to seeing ARC roll them out across all their products." Dale Saunders Technical Compliance Director, Taylor Wimpey

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# Design, Innovation and Creativity

Winner

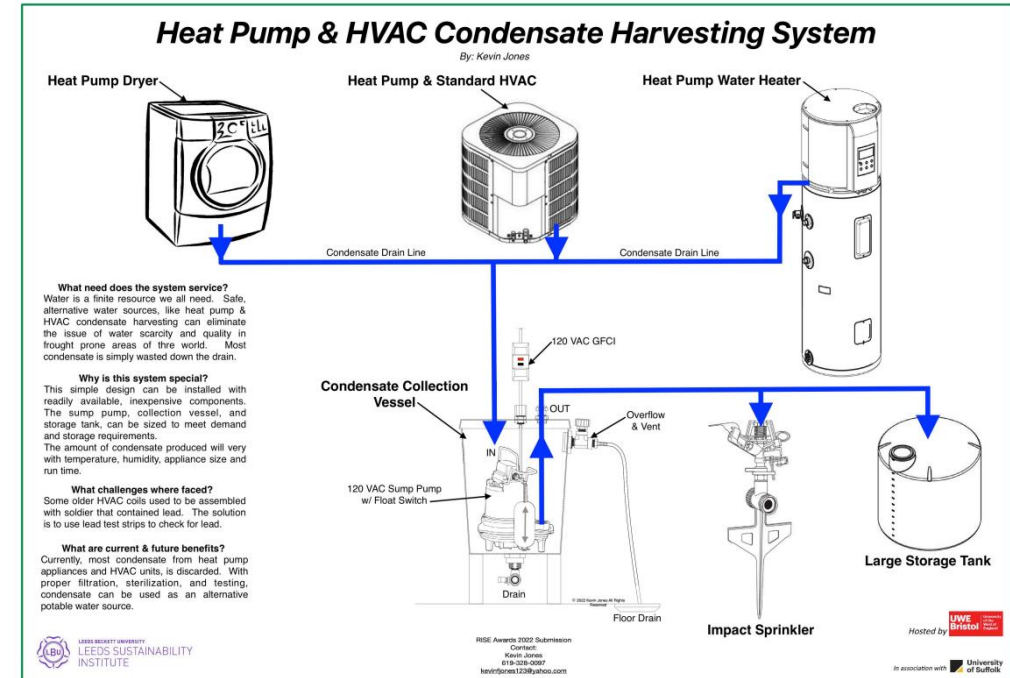
## Heat Pump and HVAC Condensate Harvester System

Kevin Jones

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# New Technologies and Building Materials

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# New Technologies and Building Materials

Highly Commended

Reliable Energy Performance Certificates

Reliable Energy  
Performance Certificates  
(EPCs) of Buildings through  
optimising the Monitoring  
and Control Systems (MCS)  
to estimate reliable Heat  
Loss Coefficient (HLC)

Catalina Giraldo-Soto

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## Publishing



Reliable Energy Performance Certificates (EPCs) of Buildings through optimising the Monitoring and Control Systems (MCS) to estimate reliable Heat Loss Coefficient (HLC)

<sup>a</sup> ENEDI research group, Energy Engineering Department, Faculty of Engineering of Bilbao, University of Basque Country/UPV/EHU, Pl. Ingeniero Torres Quevedo 1, 48013 Bilbao, Spain.  
<sup>b</sup> Leeds Sustainability Institute, School of Built Environment, Engineering, and Computing, Leeds Beckett University, Leeds, LS6 3QT, UK.  
email: catalina.giraldo@ehu.es

## Abstract

By estimating the building's **Heat Loss Coefficient (HLC)**, we can know its envelope energy behaviour and its level of energy efficiency through the **Energy Performance Certifications (EPCs)**. We can also know the **"energy performance gap"** between the design and operation phase of buildings. This performance gap has three main sources: the behaviour of the building user, the building systems' actual performance, and the building envelope's energy performance.

The main objective of this research is to rely estimate the **Heat Loss Coefficient (HLC)** that allows for obtaining more reliable **Energy Performance Certifications (EPCs)** using reliable data through **Optimized Monitoring and Control Systems (MCS)** and **improving the methodology for the Heat Loss Coefficient (HLC) estimation**. In this way, we will better understand the energy performance of the building in accordance with its level of energy efficiency, and it will allow the optimization of the design and operation phase of new or renovated buildings to **reduce the "energy performance gap"** that currently exists.

### Methodology for Heat Loss Coefficient (HLC) Estimation

The value of the design **Heat Loss Coefficient (HLC)** of the building envelope is usually available in the **Energy Performance Certificates (EPCs)** for new or renovated buildings and to know the **performance discrepancies between design and operation phases** of building, but there are still reliability problems in the methods that allow estimating the HLC of the buildings in use.

**HLC** is the total heat loss from a building resulting from **Heat Transfer Through the Envelope (UA value)** and **Heat Transfer Through Infiltration and/or Ventilation (Cv value)** per degree of the temperature difference between the Indoor and Outdoor Air Temperature ( $T_{in} - T_{out}$ ) in  $W/K$ . Being the **HLC = UA + Cv**.

The HLC can be estimated by measuring physical variables and by a steady state building energy balance where the internal Energy is approximately zero. Where different sensors measure the indoor air temperature ( $T_{in}$ ) and outdoor air temperature ( $T_{out}$ ), solar radiation to estimate the solar gains ( $S_{solar}$ ), electricity consumption to estimate the electricity gains ( $K_e$ ), CO<sub>2</sub> levels to estimate the occupancy gains ( $K_o$ ), heat supplied by the heating system ( $Q_H$ ) and the heat flows through the partition elements of the building (partition walls, floor, ceiling) ( $H_{Pfe}$ ).

There are different methods to estimate HLCs such as the standardized Co-Heating Method [3] for unoccupied buildings. However, there is currently no standardized method for occupied buildings. The ENEDI research group [2] has developed the so called Average Method [3] to estimate the HLC in an occupied building. This method has been proposed and implemented in the International Energy Agency IEA-EBC ANNEX 71 [4] and in other research works carried out by the University of the Basque Country. Both methodologies are being improved and compared in different research projects of Leeds Beckett University, the University of Basque Country - UPV/EHU and Loughborough University.

**Co-Heating Method:**  $HLC = \frac{K_s(t) + HF_{pe}(t) + S_a V_{sol}(t)}{T_{in}(t) - T_{out}(t)} [W/K]$

**Average Method:**  $HLC = \frac{Q_h(t) + K_e(t) + K_o(t) + HF_{pe}(t) + S_a V_{sol}(t)}{T_{in}(t) - T_{out}(t)} [W/K]$

### Measurement Uncertainty and HLC Uncertainty

To reliably estimate the HLC, it is necessary to have reliable data from a Monitoring and Control System (MCS) is composed of sensors and equipment with good precision to obtain quality measurement data. Every measurement has an associated Measurement Uncertainty, which will influence the reliability of the estimated HLC value. This research will allow estimating the HLC uncertainty of buildings and optimise the MCS by studying the measurement uncertainty of the variables involved in the HLC estimation.



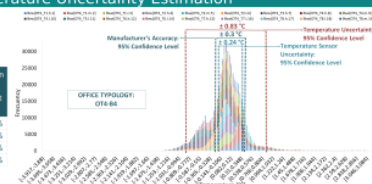
If we estimate the HLC with reliable data from an optimised MCS, and we know the HLC Uncertainty ( $U_{HLC}$ ), we will get a better HLC estimation and more reliable EPCs.

$$HLC_j = HLC_{estimated} \pm U_{HLC} \text{ [W/K]}$$

### Case of Study: Indoor Air Temperature Uncertainty Estimation

To estimate the uncertainty of Tin measurement, a 3D mobile MCS has been installed in four administrative offices of an in-use tertiary building of the University of Basque Country-UPV/EHU, located in Leica-Bilbao (Spain) [6]. Based on the methodology developed in [5], the **Temperature Uncertainty (Ur)**, **Temperature Sensor Uncertainty (Urss)**, **Temperature's Spatial Uncertainty**

Cardinal Orientation	Office Typology	Manufacturer's Accuracy [%]	Temperature Sensor Uncertainty [mK] [°C]	Temperature Uncertainty [mK] [°C]	Spatial Uncertainty [m] [°C]	Temperature's Error Weight [Rsd]	Systematic Error Weight [Rsd]	Random Error Weight [Rsd]
North-West	OT1 CS			±0.71	±0.67	11.34%	88.86%	
North-West	OT2 B3			±0.74	±0.70	10.43%	89.57%	
North-West	OT3 D5	±0.30	±0.24	±1.07	±1.05	4.91%	95.09%	
North-South-West	OT4 B4			±0.83	±0.79	8.23%	91.77%	
Systematic Errors				Systematic + Random Errors				



The main conclusion is that the overall temperature uncertainty of the monitored thermal zones is 2.4 to 10.7 times bigger than the manufacturer's accuracy of sensors. Thus using the manufacturer's accuracy as the overall temperature uncertainty value for the indoor air temperature measurement of a thermal zone could greatly underestimate the uncertainty of a thermal zone temperature [5,7]. The  $R_{\text{TH}}$  has values between 5% and 11%, the  $R_{\text{SH}}$  has values between 89% and 95%. Both ratio values allow us to know the degree of importance of the Temperature's Spatial Uncertainties (U<sub>TH</sub>) due to random errors [5,7].

## References

13. B. A. A. Omer, *Energy efficiency of heating and ventilation systems*, Springer, Switzerland, 2013. <https://doi.org/10.1007/978-3-319-00424-2>



# University of Suffolk

# New Technologies and Building Materials

## Winner

## Development of sustainable prefabricated composite walling elements for volumetric constructions

Ravijanya Chippagiri

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### DEVELOPMENT OF SUSTAINABLE PREFABRICATED COMPOSITE WALLING ELEMENTS FOR VOLUMETRIC CONSTRUCTIONS

**Vivekvaraya National Institute of Technology, Nagpur,**  
**India**  
**Civil Engineering Department**  
**Prologue**

Mass housing projects have stringent timelines, and hence it is deemed to use the technology of volumetric construction. The sustainable prefabricated composite walling (PCW) elements were designed using locally available co-fired ash (CFA) as the primary raw material. For the ease of handling and transport, the lighter density PCW elements were further developed using waste packaging material (expanded polystyrene (EPS) beads). The optimum mix of designed panel has 50% fly ash replaced with cement. The conventional aggregate is replaced with 80% crushed sand, 10% CFA, and 1% EPS. The end-product was tested for physico-mechanical, durability and functional properties and further comply as per standards IS 2185:2008 (Part 1), IS 516:1959, ASTM C1302, and ASTM C177. The developed PCW element was found 27% lighter, 6% stronger, 24% less water absorbent, and 62% less conductive with respect to conventional walling technique - Fly ash brickwork.

**Raw Material - Suitability**

Industrial wastes - CFA (no-firing waste and end in the boilers of a paper mill industry) and Fly ash.

Various physical and material characterization properties were conducted on CFA such as Scanning electron microscopy (SEM), X-Ray diffraction (XRD), X-Ray fluorescence (XRF), and other related tests. It was proved to be suitable as a substitution for fine aggregate in concrete making.

Crushed sand was used as a replacement to the conventional river sand. Waste packaging material - EPS beads were used as an insulation material as well as to make the end-product less dense.

**Experimental and Computational study of walling material**

**Experimental study**

Walling materials were tried with different mix proportions and final mixes were finalized based on the testing parameters such as density and compressive strength. Furthermore, other mechanical (tensile and flexural), durability (liquid chloride permeability) and functional (thermal conductivity) property tests were performed and the end-product was found to be suitable for walling purpose.

**Computational study**

Walling materials were tried with different mix proportions and final mixes were finalized based on the testing parameters such as density and compressive strength. Furthermore, other mechanical (tensile and flexural), durability (liquid chloride permeability) and functional (thermal conductivity) property tests were performed and the end-product was found to be suitable for walling purpose.

**Table: Comparative analysis of commercially available walling products and developed PCW mix**

Material	Density (kg/m <sup>3</sup> )	Compressive strength (MPa)	Water absorption (%)	Thermal conductivity (W/mK)
Brick	1800	7.00	15.00	1.25
Fly ash Brick	1800	6.20	10.00	1.05
PCW Element	1312	7.05	7.04	0.40

**Peak cooling load comparison**

Optimal building design was carried out for a real-scale structure with developed end-products with the BIM based computational tools. Both structural and energy models were considered.

From the energy perspective, 46% reduced embodied energy and around 50% reduced peak cooling loads were observed on comparison with fly ash based brickwork.

**On-field application**

Panel were cast and a small-scale model house was erected for post-eraction functional evaluation. The time study observed a 20% reduced total duration when the precast technique was preferred over conventional technique. During the functional evaluation of erected model house, around 6% reduction in the internal temperature was observed on comparison with fly ash brick model.

Under the Department of Drinking Water and Sanitation (Ministry of Jal Shakti), Govt. of India, demonstration of Technology for Socially deprived community is done in line with local governing authorities. As the research product is demonstrated on field, industry is supporting to scale up the concept further for more PCW elements for toilet units, security guard rooms, police booth, compound wall, internal housing walk, etc.

The product is found sustainable, energy efficient, time saving and an alternate employment generator.

**Implications**

- Sustainability**: Includes alternate materials, Less embodied and operational energy, Re-use of waste industrial wastes, Conserves energy.
- Energy efficient**: Less embodied and operational energy, Conserves energy.
- Quality & Waste Management**: Better quality end-product, Less on-site waste.
- Time Saving**: Faster on-site construction.
- Value to the Society**: Provides alternate living conditions, Economical for mass housing.

**Publications**

1. Ravijanya Ch, H.R. Gaoth, R.V. Ralegaonkar, M. Rale, A. Shan, A. Bhas, Application of Sustainable Prefabricated Wall Technology for Energy Efficient Social Housing Sustainability 2021, 15, 1195. <https://doi.org/10.3390/su15111195>

2. Chippagiri R, Bhas A and Ralegaonkar RV, Development of sustainable prefabricated housing system by small-scale experimental model. Proceedings of the Institution of Civil Engineers - Engineering Sustainability, <https://doi.org/10.1080/13697022.2021.1910712>

**Ravijanya Chippagiri<sup>1</sup>, Ana Bras<sup>2</sup>, Rahul V. Ralegaonkar<sup>3</sup>**

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<sup>2</sup> Associate Professor, Built Environment and Sustainable Technologies Research Institute, Liverpool John Moores University, Liverpool, UK.

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# Sustainable Developments

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# Sustainable Developments

## Highly Commended

Eco-Board: Light but just as strong evolution composites

Rolling out sustainability in an SME - Changing approach

Nafa Duwebi

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ECO-BOARD:  
LIGHT BUT JUST AS STRONG  
**EVOLUTION COMPOSITES**



**What has been the impact of working with DE-Carbonise?**  
As part of the initial work package, prior to the design phase, the DE-Carbonise team carried out the mechanical testing of eco-board material samples to ascertain the material characteristics under laboratory conditions. In parallel, the preparation of 3D files and CNC trials at Markston Street Workshops were undertaken to determine optimal cutting speeds/feeds/tooling.

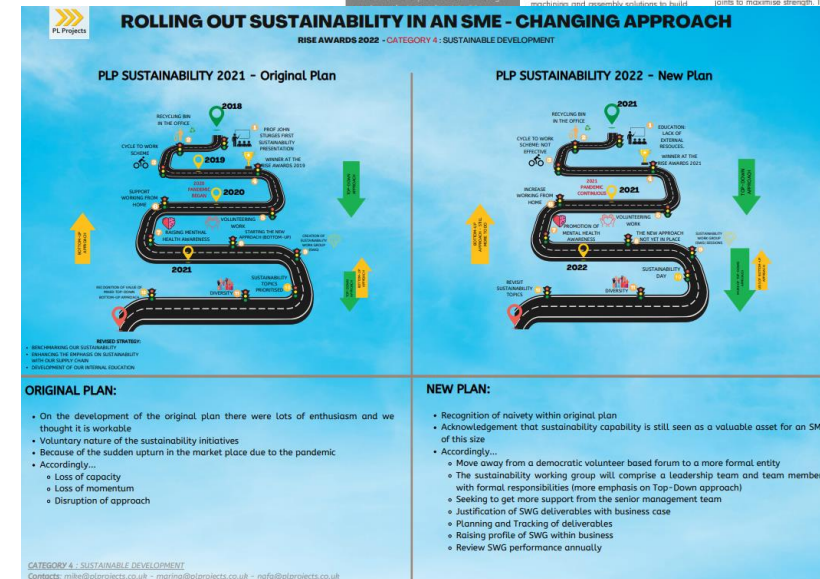
Then as part of the next, longer work package, the team investigated the possibility of joining solutions focusing on the strength and ease of assembly. Subsequently, the eco-boards were CNC cut to the required dimensions. The prototype box was assembled using a non-toxic adhesive. The strength of the prototype was evaluated by loading it incrementally with weight.

The mechanical testing results informed the design process on the material strength and allowed for the optimisation for different loading scenarios.

The 3D model of the packaging was developed considering several types of corner joints to maximise strength. The CNC footprints

**About the business**  
Evolution Composites is a family-run business based at the Enterprise Centre in Tinsford that specialises in the design

**Why did you engage with DE-Carbonise?**  
Evolution Composites approached DE-Carbonise for support in developing suitable machines and assembly solutions to build



# Sustainable Developments

## Winner

## St Richard's Hospice Build

Speller Metcalfe

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THE CHARTERED INSTITUTE OF BUILDING



SpellerMetcalfe

**CLIENT**  
ST RICHARD'S HOSPICE

**LOCATION**  
WORCESTER

**SCOPE**  
NEW BUILD / REFURB

**ARCHITECT**  
ASSOCIATED ARCHITECTS

**POS**  
FIRMINGERS

**VALUE**  
£1.8M

**DATES**  
JANUARY 2020 - MARCH 2021

**DURATION**  
60 WEEKS

### ST RICHARD'S HOSPICE, BUILD 2020

Speller Metcalfe was appointed to deliver Stage 2 of repeat-client St Richard's Hospice's 'Build 2020' project.

The project saw the creation of a range of specialist therapeutic rooms to expand the Hospice's 'Living Well' centre, including an exercise studio, art studio, horticultural therapy room, occupational training therapy kitchen and music and film therapy room. The works also comprised an infill to an enclosed courtyard with construction of a Glulam timber frame structure with lattice-work roof carrying glazed roof lights known as The Green.

A key challenge at St Richard's Hospice was managing the logistics of installing a timber frame to an internal courtyard with no direct access to the outside, whilst also located within the confines of a live hospice - a sensitive environment where special consideration had to be given to minimising disruption at all times for the patients and their families.

Clear communication and an open and honest approach of our site management team was required to coordinate works effectively so as to minimise disruption, utilising our experience of working in similar environments, including numerous phases of work at the Hospice (including building the original hospice many years prior) to phase and plan the works effectively.

The works were delivered during the Covid-19 pandemic where stringent measures were put in place to allow works to continue whilst ensuring the safety and security of the vulnerable residents.



# Heritage Award for Restoration or Retrofit

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# Heritage Award for Restoration or Retrofit

## Winner

## Fighting air pollution with Microtech Filters Microtech Filters

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### FIGHTING AIR POLLUTION WITH MICROTECH FILTERS

#### About the business

Air pollution is a growing problem in towns and cities around the world. But a team at Tech Air Solutions are attempting to improve the situation by developing a set of 'smart bollards', which clean the air at locations where there are a high density of traffic and people.

Co-Founder, Andrew Thompson, explains how the idea came about:

"It all started when I saw a BBC Inside Out programme that said at McDonalds drive-throughs, air quality was 25% worse than elsewhere. I conducted my own research into air pollution and found out that, while a lot of companies are now measuring air quality levels, few are doing anything to improve air quality directly."

"So, working with Raddy Moore and my colleagues at Microtech Filters, we produced the idea of smart bollards fitted with filters, fans, and Internet of Things (IoT) technologies, which could improve the surrounding air quality. We thought they could be positioned at high-density traffic hotspots, such as schools, drive-throughs, train stations, schools, and bus stops."

The company developed an oversized prototype to test the concept. The bollard draws in air, monitors it, cleans it via a filter and then pumps it back out. Early tests were positive, indicating that the device could reduce particulate matter 2.5 by up to 40%. However, Andrew wanted to better understand the science behind it and gather evidence.



Mobile testing unit and bollard

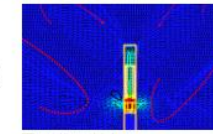
#### Why did you engage with DE-Carbonise?

Having worked with the University before through the Invest to Grow scheme, Andrew approached our organisation again in early 2021. The firm was awarded 70 hours of fully funded research time through our DE-Carbonise Project, a project set up to help local SMEs increase sustainability.

Dr Hirbod Varasteh, Low Carbon Researcher, supported by Dr Shahed Mokam, Lecturer in Motorsport Engineering, produced a CFD (Computational Fluid Dynamics) model of the bollard to simulate air flow through the filter and estimate the performance of it. The aim was also to optimise energy use. The researchers then made recommendations on how to improve air flow pattern, design, and performance.

#### What has been the impact of working with DE-Carbonise?

"The CFD model was fantastic for us; it was instrumental. It showed how particulates move through the bollard, their velocity and how they are distributed when they come out, within two cubic metres. We know from this that we can locate the bollards approximately four metres apart to achieve optimal improvements in air quality. This research model provides important evidence to show interested parties."



CFD model of the smart bollard

#### Next steps

"The researchers also made some recommendations about how to make the fan more efficient and reduce the load on it, and we aim to take those recommendations forward in the next phase."

Tech Air Solutions is now planning to develop the solution, so it automatically switches on when the air quality reaches a certain threshold and switches off again when it improves sufficiently.

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derby.ac.uk/decarbonise

# Behavioural Change

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# Behavioural Change

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## The Community Data Platform Rebuilding Communities with HUMAN, ASSET and ACTIVITY data

Yeme Tech

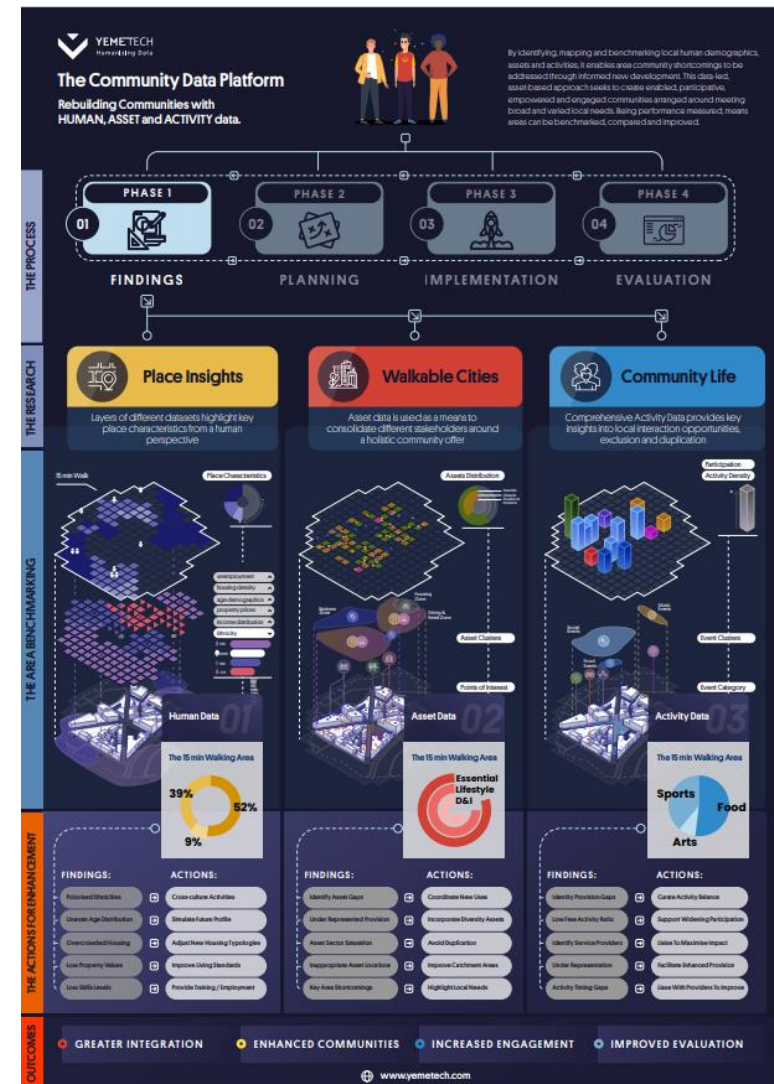
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# Behavioural Change

## Winner

## The sun is shining on Trusty Pets

### Trusty Pets

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## THE SUN IS SHINING ON TRUSTY PETS



### Why did you engage with DE-Carbonise?

Trusty Pet Supplies identified a business case for becoming more energy efficient and has made an ongoing commitment to becoming low carbon by investing in measures to reduce their energy consumption and carbon emissions. The firm has invested over £30,000 in a 31kWp solar photovoltaic (PV) system, to meet the company's electricity demand from renewable solar energy and LED lighting.

The solar system produces over 25,500kWh of electricity per year, saving 3.5 tonnes of carbon emissions. Moving to LED has reduced a further 7 tonnes of carbon emissions.

When the company purchased a new site in 2021, they contacted the DE-Carbonise team to enquire about making the new site more energy efficient.

### What has been the impact of working with DE-Carbonise?

A carbon reduction audit identified an opportunity to make significant cost and energy savings by upgrading the lighting in their premises.

### About the business

Trusty Pet Supplies is a family-run pet supply business based in Derby since 1999, consisting of 3 generations of family, with over 50 years of experience in the pet trade as well as experience with a variety of animals, including dogs, cats, rabbits, guinea pigs, hamsters, gerbils, and fish.

Trusty Pets therefore decided to invest in energy-efficient LED lighting which reduced their energy consumption by 25,195 kWh and resulted in an annual carbon saving of 7 tonnes a year. They received a grant for £9,950.00.

Following the energy efficiency measures achieved by changing to LED, the company then applied for a second grant from the project and were awarded £9,840 towards the cost of installing a 31kWp solar photovoltaic system on their new unit.

The energy efficient and energy generating measures fitted at the new unit save Trusty Pet Supplies Ltd over £9,500 per year and reduce their annual carbon emissions by 12.6 tonnes.



LED lighting

The new site now has LED lights controlled by occupancy sensors and is generating its own electricity.

David Carlin, the company's DE-Carbonise Champion has been extremely happy with the scheme and is looking at other areas that could improve energy efficiency.

### Data

#### Grant 1

- Annual Energy Saving (kWh): 25,195
- Annual Carbon saving (KgCO<sub>2</sub>e): 6,986
- Annual Cost Saving: £4,956
- Value of Grant: £9,950.00

#### Grant 2

- Annual Energy Saving (kWh): 24,521
- Annual Carbon saving (KgCO<sub>2</sub>e): 5,667
- Annual Cost Saving: £4,659
- Value of Grant: £9,840.00

### Next steps

The company are interested in investing in an electric vehicle in the future and will continue to identify further carbon and resource saving measures within its site and business activities as opportunities arise.



[derby.ac.uk/decarbonise](http://derby.ac.uk/decarbonise)

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# NOVAVIDA - Novel Approach for Vital Infrastructure Post Disaster

NOVAVIDA - Ornella Iuorio

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**NOVAVIDA - Novel Approach for Vital Infrastructure Post Disaster**

A paradigm shift in how post-disaster reconstruction processes occur will happen when community wellbeing and infrastructure deployment are equally considered.

**The Project AIM**  
The NOVAVIDA Project, co-designed with international stakeholders, evaluates post-disaster management cases in four cities in Ecuador, to create new bottom-up community-led frameworks for infrastructures development.

**HOW**  
Using as critical lens the inhabitants, the UN-Habitat principles for adequate housing and the "Build Back Better" principles of the Sendai Framework for post-disaster reconstruction, the work combines policy review, risk spatial analysis, field work, semi-structured interviews, constructive and architectural analysis, to propose new future urban & building scenarios.

**1. The Place**  
**ANALYSIS:** Interviews & field work highlighted the lack of connectivity of the current resettlements with the existing cities centres, the total disengagement in planning for economic and civic growing of the inhabitants, as well as the lack of any proper urban planning of the new areas. Looking at the buildings, the adoption of standardised building, arranged in infinite replicated rows, showed lack of flexibility (incapacity to accommodate future families growth and evident thermal discomfort). Finally, the analysis of the current conditions of the house, demonstrated how inhabitants, although strongly limited by the adopted housing typologies and technologies, still attempted to (re)appropriate the spaces in the intent to provide additional areas for their families, too often ignoring the increased vulnerability at which they are exposing themselves and their future generations.

**PROPOSAL objectives:** A. Reduce the Urban/Building/Community vulnerability. B. Encourage environmental and economic sustainability. C. Develop a sense of community. D. Develop a modular & flexible system for multiple uses. E. Adopt urban and architectural typologies belonging to Manabí Province culture. F. Use local materials and techniques. G. Facilitate Progressive Growth. H. Ensure anti-seismic performance and thermal Comfort.

**INNOVATION.**  
Development of full urban neighborhood planning & 4 housing typologies, reinterpreting layouts & material from vernacular architecture, use of engineered bamboo (for seismic protection & boost of local economy), passive ventilation for bio-climatic comfort, and allowing progressive growth for the growing of future generation & commerce.

**IMPACTS of the proposal were discussed during a series of workshop in Ecuador in April 2022.** To involve all the stakeholders (i.e. local government, municipalities, universities, and post-earthquake resettlements inhabitants), we experimented with VR technology to allow understanding and involvement of also non-technical people. The feedback open opportunities to future prototyping. The level of acceptance of such solutions are paramount for the long-term vulnerability reduction and the social & environmental well-being of the survivors (UN Sustainable Development Goal 3).

**NOVAVIDA workshop**  
April 27 - April 28, 2022  
QUITO - ECUADOR

**RESEARCH GROUP:**  
Iuorio (PI), Bernal (Co-I), Janoschka (Co-I), Duran (Co-I), Romano (Co-I), Russo (PDRA), Testori (PDRA), Bonifazi (RA).

**Partners:** LEEDS BECKETT UNIVERSITY, UNIVERSITY OF THE WEST OF ENGLAND, UNIVERSITY OF SUFFOLK, GCRF, THE BRITISH ACADEMY, HACSIO, UNIVERSITY OF LEEDS.

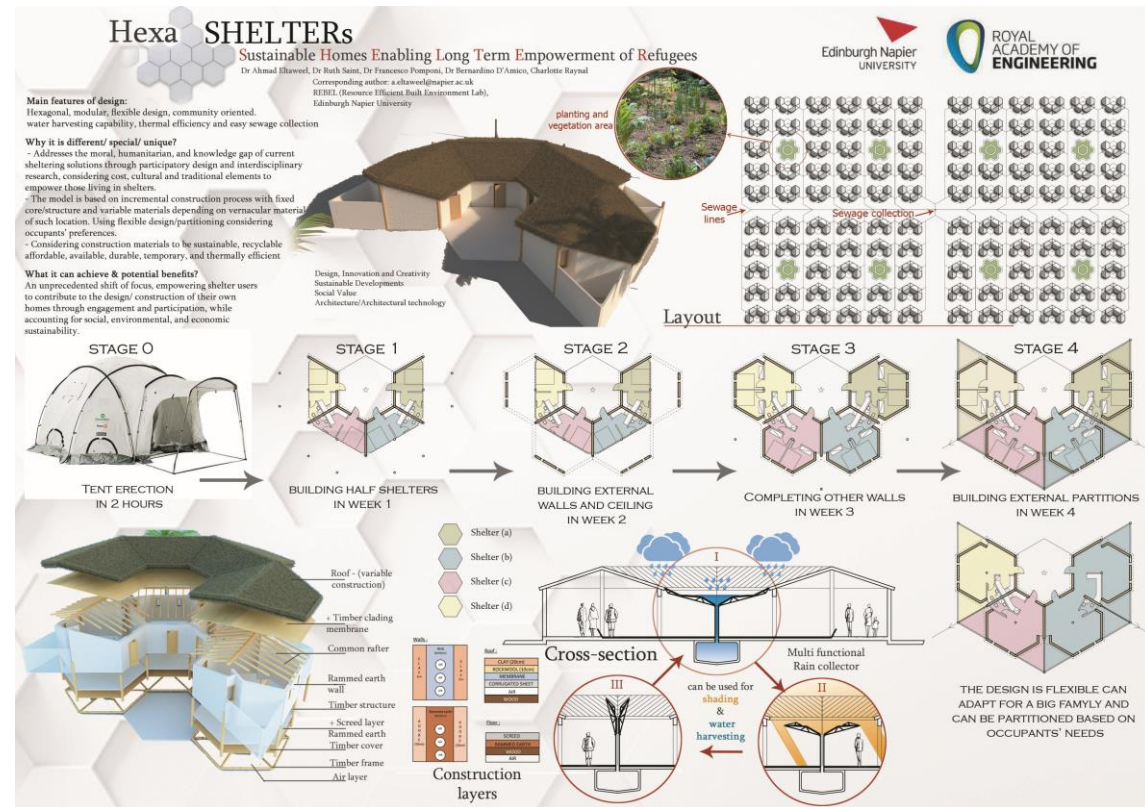
**Website:** [www.novavidaproject.com](http://www.novavidaproject.com)  
**Email:** [info@novavidaproject.com](mailto:info@novavidaproject.com)



# Social Value Winner

## Sustainable Homes Enabling Long Term Empowerment of Refugees

Ahmad Eltaweel



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# Enterprise

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## Collaborating for carbon reduction

Rosemary Horry



### COLLABORATING FOR CARBON REDUCTION



#### 1. INTRODUCTION

- **The De-Carbonise Project** is a partnership between the University of Derby, Derby City Council & Derbyshire County Council.
- **The project** matches new-to-the-low carbon economy to specialist advice focusing on SMEs, De-Carbonise supports low-carbon initiatives through awarding grants.
- **Key areas** include improvements in energy efficiency, increasing deployment of renewables & low carbon production & manufacturing.
- **Objective** is to increase economic resilience in the East Midlands through lowering the cost-base of SMEs, stimulating demand for low CO<sub>2</sub> economy goods & services, assisting the region to meet its greenhouse gas reduction & renewable energy targets.

#### 2. APPROACH

- **We enable SMEs** to take their carbon reduction activities forward with formal plans & research and development opening up supply-chain & procurement opportunities.
- **Grants of up to £20,000** (to a maximum of 40% cost) enabled the installation of low carbon technologies including LED lighting, localised energy generation (PV) & heat recovery.

<https://www.derby.ac.uk/business-services/funding/de-carbonise-project/>

#### 3. ACHIEVEMENTS

##### Regional SME benefits achieved to date:

- Over **453 SMEs** have received support through DE-Carbonise & many more have received environmental audits.
- Financial support provided to **166 SMEs**
- Over **3,451,140 kWh** per year in energy savings and cost reductions of £834,990 per year.
- GHG savings of over **32,465 tonnes** per annum against a target of 2,401 tonnes per annum.
- Over **36 SMEs** engaged in long term research & development activity
- An **average of 901 tonnes** per year per SME.
- Building a **community of practice** with SMEs sharing their learning & supporting each other through workshops & events.



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# Enterprise Winner

## Energy Efficiency as a Service: A shared-savings solution to energy use reduction

SMARTech Energy Ltd

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### Energy Efficiency as a Service

A shared-savings solution to energy use reduction

**Case study:**  
STEM college situated in South West England

The college buildings mainly contain staff offices and lecture rooms spread over two floors. There are also workshops used for practicing science, technology and engineering. The college is equipped with a heating ventilation and air conditioning system and renewable energy in the form of solar photovoltaic. The college wished to reduce its carbon emissions and improve its sustainability credentials, however it did not have a budget to do this.

To overcome its budgetary constraint, the college entered into a 10 year EEaaS contract in early 2021. The initial strategy features energy monitoring, replacement LED lighting, motor optimisation, heating system controls and base load reduction. Data from the first year of the scheme assessed using IPMVP methodology suggests the following reductions will be achieved over the length of the contract period:

- 43% energy reduction
- 237 tonnes carbon reduction
- £200k overall cost reduction (split with SMARTech energy)

**Why Energy Efficiency as a Service?**

SMARTech energy's experience shows that many businesses want to reduce energy use, cut carbon emissions and reach sustainability goals, however, many cannot commit to the capital expenditure or lease costs required to invest in low-energy technology and renewable energy generation. With mounting financial, legislative, contractual and ethical pressure on UK manufacturing to be more sustainable, SMARTech energy looked to develop a solution to remove the financial barriers from energy reduction schemes. We call this Energy Efficiency as a Service (EEaaS).

**How does it work?**

Essentially, if enough energy savings can be identified to cover the cost of external investment in low-energy technologies over the length of a contract, we can provide the investment required to implement the changes at the client's buildings, undertake monitoring and verification (M&V) to evaluate effectiveness, provide ongoing consultancy to optimise savings and deal with compliance requirements and reporting legislation. There is no requirement for capital expenditure, finance or leasing, nevertheless, the client is able to demonstrate to customers, potential customers and in tendering for contracts that real action has been taken to reduce carbon emissions.

After an initial assessment of energy use data and existing technologies and work practices, we can predict if EEaaS will work for an organisation. The potential savings must be high enough to cover the costs of the scheme and provide a share for the client. In outline, the scheme will then follow this path:

- Electrical monitoring installed to provide a detailed picture of energy use
- Full site survey and evaluation of utility billing and energy use data
- Report to client on projected actions and anticipated savings
- Agreement to go forward, with the cost savings shared between SMARTech energy and the client for the term of a contract
- Installation of energy saving technology chosen from a portfolio comprising of 33 solutions,

along with renewable energy generation where appropriate.

- M&V undertaken using the International Performance Measurement and Verification Protocol (IPMVP®) to verify performance and savings throughout the length of the contract. Savings payments adjusted annually in line with the performance of the scheme
- Ongoing consultancy provided to identify further efficiencies and help with compliance and legislative responsibilities where appropriate (ie. ESOS, SECR).

**To sum up**

We believe that the inability of many businesses and organisations to invest in energy saving technologies is hampering the journey to Net Zero in the UK. By utilising the gap between potential and current energy spend to finance energy reduction measures, SMARTech energy provides an innovative solution to this problem.



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# Collaborative Working

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# Winterstoke Hundred Academy Expansion - Sustainability Lab

Kier Construction



**UWE Bristol** | University of the West of England

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# Collaborative Working Winner

## How can MMC contractors' business models communicate confidence to public clients?

Ali Saad

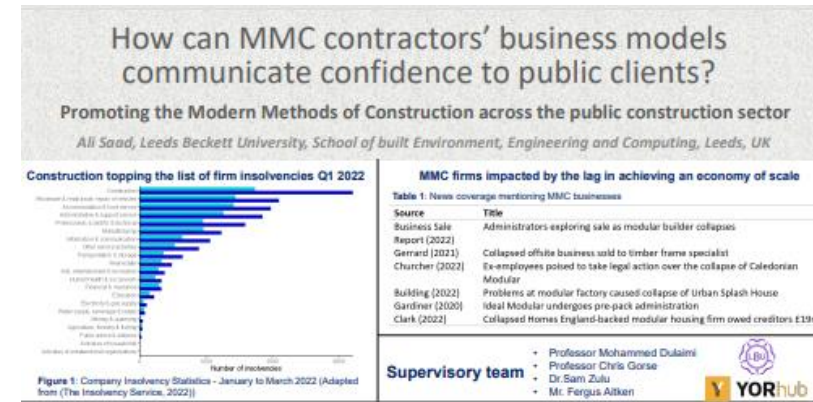
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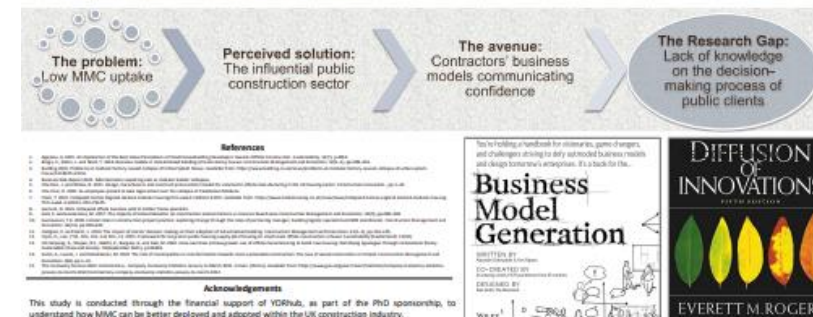
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With the growing rate of insolvencies and the increasing number of MMC firms going into liquidation, research is requested more than ever to investigate the means in which MMC businesses can thrive and enhance their commercial standing. Contractors' business models are perceived as old and inefficient (Goh and Loosemore, 2017). The significance of appropriate business models has been described as the first condition enabling better MMC adoption (Bregre et al., 2014), where existing traditional ones are identified as unviable. The literature herewith emphasises the importance of improving currently utilised models, yet the effective improvements remain uncaptured. This study focuses on special clients rather than generalising the overall research. Knowing that MMC uptake is low in the public sector (Charlson and Dimka, 2021), public clients attain characteristics that can be argued to drive innovation adoption in the whole construction industry due to their unique nature and demand (Hyun et al., 2021). In the construction context, these clients have been described as the 'gatekeepers' in promoting innovation across the industry (Salimi et al., 2022). Enhancing MMC uptake among public clients would therefore influence less dependency from the public sector on conventional methods currently dominating over 70% of all new developments in the United Kingdom (Agapiou, 2021). If these influential organisations adopt MMC as a practical solution, other organisations will follow, thereby accelerating innovation adoption across the construction sector (Oli-Sarpompong et al., 2022). Studies focusing on the public sector described public clients as 'a change-restraining force' for MMC diffusion, calling for research in the same direction (Hedgren and Stehn, 2014, p.143). However, albeit influential in their procurement power, Gustavsson (2018) underlines that change among public clients is not easily achieved. The main question remains; how can MMC contractors reinvent their business models to effectively communicate confidence to public clients towards penetrating the public sector?



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# Education and Training

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# Education and Training

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Apprenticeships: how can they support sustainable organisational management?  
With a focus on degree apprenticeships

PI Projects – Josie Rothera

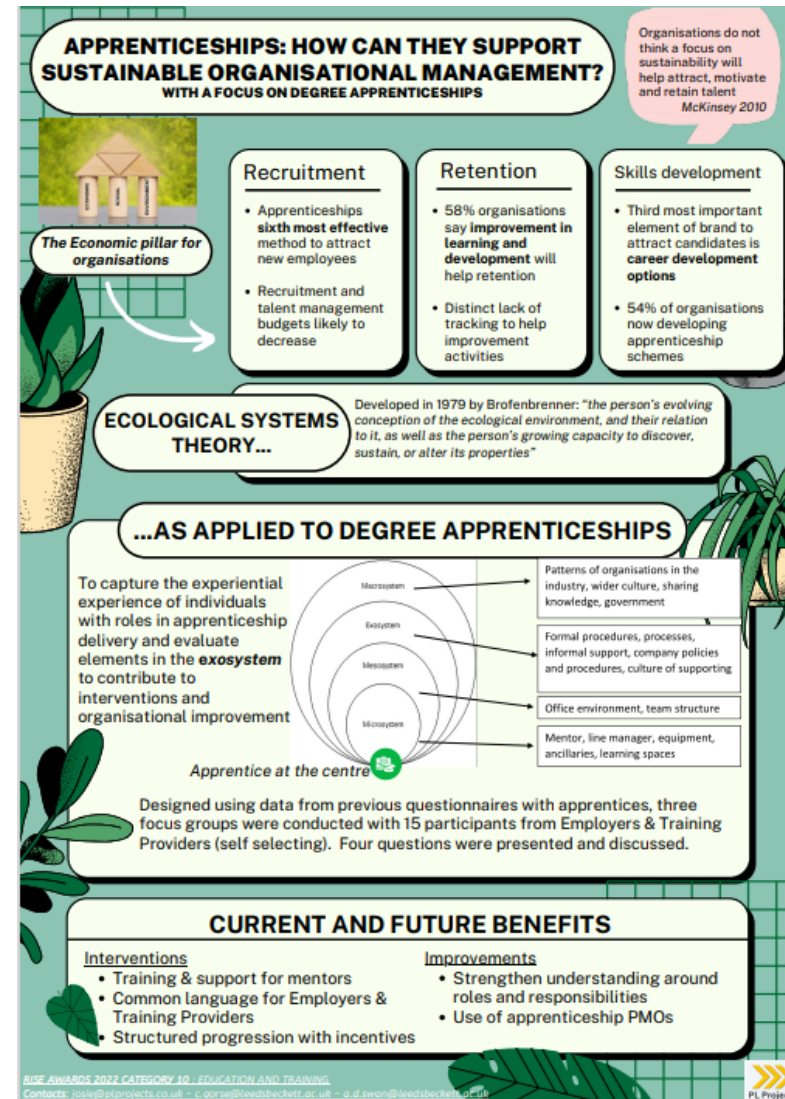
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# Fire and Safety

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### CONSTRUCTION DIARY

Lois Whitnell

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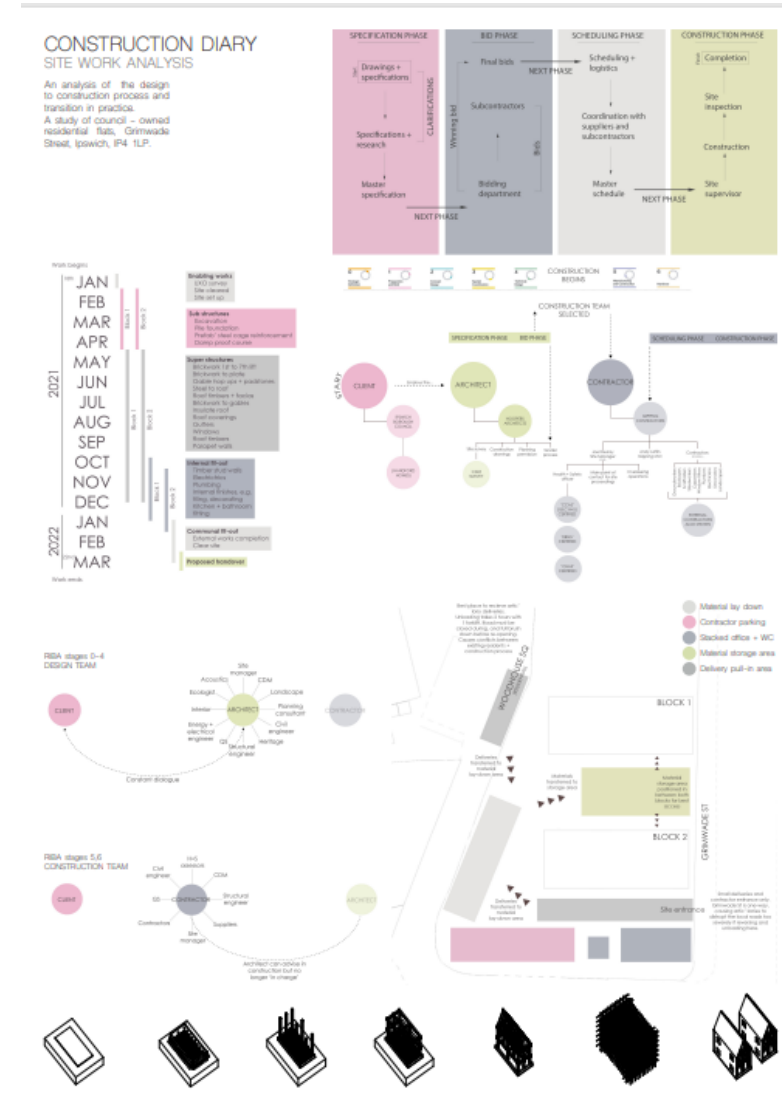


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# Fire and Safety Winner

## ARC Open State Cavity Barrier

ARC Building Solutions



### ARC Building Solutions

Award-winning manufacturers of Cavity Fire Barriers and Cavity Closers

**ABOUT** Unveiled in November 2021, ARC's **Open State Cavity Barrier (OSCB)** solution has been specifically designed to stop the spread of fire in ventilated cavities.

Compliant to ASFP TGD19 standards, the OSCB is highly effective at **preventing vertical fire spread** within a building's external cavity as it has a reactive intumescent layer that rapidly expands when exposed to heat in a fire event, closing off the air gap.

Helping to eliminate installation errors, ARC has also taken many innovative steps to support OSCB installers on-site. **Quick Reference (QR) codes** are printed onto the product which when scanned allow customers to access easy-to-follow tutorials on the correct handling and installation of the cavity barrier whilst on site.

To make product identification and traceability easy, the OSCB is **also colour coded** and key information such as the batch code, product code and size, is individually **printed onto the barrier** meaning that even when removed from its packaging or installed, it is easily identifiable.

#### COMPETITIVE EDGE

ARC is the first manufacturer to link QR codes **directly** to its own installation videos and not to a third party app.

The instant access this system provides to information supports installer knowledge and usability of the product.

### RISE AWARDS 2022

Award: Fire and Safety

Entry: ARC Open State Cavity Barrier



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#### BENEFITS AT A GLANCE

- ASFP **TGD19** compliant
- Offers either **60min or 120min** fire integrity
- **25mm or 44mm** air gap for ventilated cavity
- Fixing brackets included as standard
- Suitable for use horizontally
- QR codes support **correct** handling and installation, preventing error and ineffective performance
- Colour coding and clear product markings support **easy product identification and traceability** – even when removed from packaging

**TESTIMONIAL** "When ARC first introduced the QR codes onto their products, we realised that this was going to be of **huge benefit** for our contractors and installers. ARC already offer on-site training for our teams but the QR code gives them instant access to extended guidance."

"Search engines and product websites can often be difficult and time consuming to navigate. Having the QR codes that take you directly to specific product pages and videos really simplifies the process. Our teams are more likely to use these to access the extended guidance and for us, that helps to achieve the **correct installation**. We are looking forward to seeing ARC roll them out across all their products."

Dale Saunders Technical Compliance Director, Taylor Wimpey

**WHY CREATED** The OSCB has been developed in response to **market demand**, providing contractors with a robust fire stopping solution that still allows air movement within external wall cavities on properties with ventilated facades, yet delivers a resilient and fire-safe building.

The new labelling system has also been implemented as a result of customer feedback which brought to light the issue that many installers are **uncertain of the installation techniques** required for different cavity barrier products. Requirements vary between each product and if a fire-stopping solution isn't installed correctly it can have a detrimental effect on performance. By printing QR codes onto the product, customers can access all handling and installation advice needed whilst on site. Quick and convenient, the QR codes are **accessible to all** and support installers to achieve greater accuracy at the touch of a button.

Providing **traceability** and the 'Golden Thread' of information is another reason why the new labelling system was devised; initiated in light of the new Building Safety Bill. Traditionally, product information such as the batch code, product code and size are printed onto secondary packaging which can get thrown away at the early stages of a project, meaning vital information is lost. Customers raised their concerns around this which prompted ARC to find a way of printing information onto the barrier itself, meaning that even when removed from its packaging or installed, it is **easily identifiable**.

Claire Long, ARC Building Solutions,  
Gildersome Spur, Leeds, LS27 7JZ  
[www.arcbuildingsolutions.co.uk](http://www.arcbuildingsolutions.co.uk) 0113 252 9428.

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# Carbon Reduction and Wellbeing

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# Carbon Reduction and Wellbeing

## Winner

CAWARDEN CO. LTD's driving green for a better future

CAWARDEN CO. LTD

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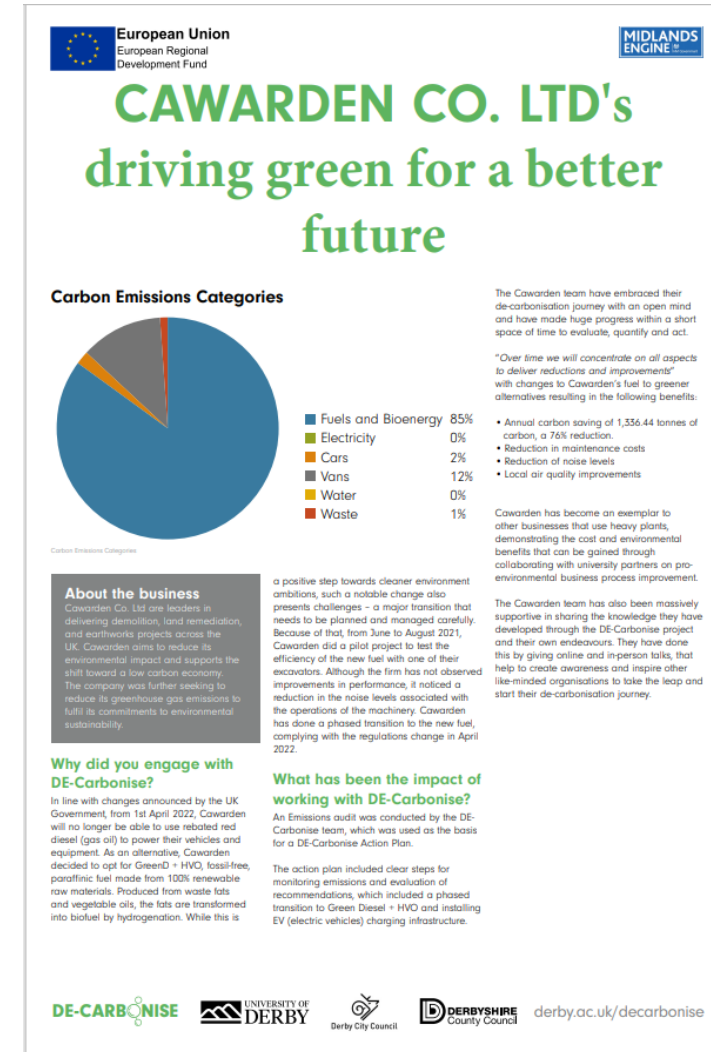


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# Asset Management

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# V-elo city

Lucelia Rodrigues



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# Asset Management Winner

## EFFECTIVE ENERGY USE AT BRIDGE THERMOPLASTICS

Bridge Thermoplastics

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### EFFECTIVE ENERGY USE AT BRIDGE THERMOPLASTICS

#### About the business

Bridge Thermoplastics produces UPVC profiles for a variety of sectors and customers, using recycled plastic. An expansion of the company has resulted in the production of a wide variety of custom profiles, and this had resulted in the cooling capacity of the cold-water chiller system reaching its maximum output. The site has seven different lines for producing a broad range of plastic profiles, and each line can be adapted to make a different profile. The company uses water baths that the profiles run through, and cooling water fed directly into a 'collimator' to cool the profiles.



Bridge Thermoplastics then started working with the University of Derby to identify the maximum cooling demand from the largest profiles.

Dr. Hirbod Varasteh, a Researcher from the University of Derby, determined whether the two chillers on site could provide sufficient cooling for the target volumes of plastic production. He also analysed the data to see if there was a clear gap between the cooling capacity and the demand. Hirbod's report aimed to improve the cooling system at Bridge Thermoplastics by considering the size of the chiller, pump, and heat exchanger.

It was identified that the cooling system's bottlenecks needed to be fixed to improve efficiency and reduce carbon emissions.

Hirbod identified that Bridge Thermoplastics' cooling system had issues: the cooling tank was set at 12°C, but the cooling water temperature spiked to 16-18°C. This resulted in a reduction in production quality and production rate as well as an increase in operating costs and carbon emissions.

Although it was determined that Bridge Thermoplastics' chillers had enough capacity for most of the work planned, calculations showed that the organisation needed to have an appropriately sized pump and heat exchanger to achieve an efficient cooling system with the available chiller. Hirbod therefore recommended the best option for the cooling system design to improve efficiency and reduce carbon emissions.

The recommended options can solve Bridge Thermoplastics' issues, providing higher efficiency and the required cooling temperature with a lower pump flow rate. They have allowed Bridge Thermoplastics to schedule work more effectively so that the maximum output of the chiller would not be exceeded.

A grant administered by Tom at Derby City Council, enabled Bridge Thermoplastics to replace the heat exchangers with a larger plate model, which could be expanded easily to cope with larger cooling demands if required. The company took this opportunity to simplify the cooling pipework and upgrade the pumps.

At the same time, the grant was also used to replace all lights within the factory with LED lighting, which made a vast improvement to light levels and is forecast to save 6.5 tonnes of carbon emissions per annum. Advice from the team has also been taken to reduce compressed air use and repair leaks in the pipes, with plans to upgrade the compressors to variable speed models in the future.

#### Why did you engage with DE-Carbonise?

Bridge Thermoplastics' challenge was calculating the cooling demand to design an appropriate cooling system. Recycled PVC is used in the extrusion process for larger decking plastic. Bridge Thermoplastics has struggled over the cooling process post-extrusion for larger decking plastic.

#### What has been the impact of working with DE-Carbonise?

In the summer of 2020, Bridge Thermoplastics engaged with the DE-Carbonise team and the City Council carried out an on-site carbon reduction audit, producing a report providing advice on reducing energy, resource efficiency and carbon emissions.

Key recommendations from this included upgrading the lighting to LED, considering solar photovoltaic panels as part of a roof replacement, and undertaking a compressed air audit.

A requirement was also identified to address the cooling needs of the business.

**Data**

- Annual Energy Saving (kWh): 23,326
- Annual Carbon saving (kgCO<sub>2</sub>e): 6,468
- Annual Cost Saving: £2,959.00
- Value of Grant: £6,745.60

*"As a small business we wondered if we were too small to be helped, but we found that the DE-Carbonise Team was extremely helpful and able to work alongside us to consider our options."*



[derby.ac.uk/decarbonise](http://derby.ac.uk/decarbonise)

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Derby City Council

DERBYSHIRE  
County Council

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# Civil Engineering - Infrastructure and transportation

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# Civil Engineering - Infrastructure and transportation

Winner

V-elo city

Lucelia Rodrigues

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# Digital Innovation

## Highly Commended

## LoCem® Modular Anode Unit (MAU)

C-Probe

RISE Award Submission 2022 - New Technologies and Building Materials

**LoCem® Modular Anode Unit (MAU)**

The development of a modular, low carbon ICCP anode for sustainable enhanced service life of new infrastructure

**The Current Problem**

Climate change is posing a huge threat to construction and our current infrastructure. The effects of climate change, such as acid rain and carbonation, are proving disastrous for the environment and are accelerating the rate of corrosion and deterioration in structures.

In order to combat this, construction needs to be contributing to reducing emissions, adapting their processes and building in future resilience. Ueli M. Angst highlights how society faces two main challenges: maintaining existing ageing infrastructure in developed countries and establishing more sustainable infrastructure in emerging countries[1]. The latter is particularly important for future resilience of developing countries and ensuring services and infrastructure can stand the test of time.

**Structural Resilience Is Needed for New Infrastructure**

[1] Angst, U.M., Challenges and opportunities in corrosion of steel in concrete, Materials and Structures, 51:4, 2018

**Our Solution**

To create sustainable, resilient new infrastructure, this starts with protecting the internal steel from corrosion. The LoCem® Modular Anode Unit (MAU) is a factory-made moulded impressed current cathodic protection (ICCP) component that can be attached in an array directly to steel reinforcement prior to pouring the concrete. The purpose of the MAU is to offer vital protection from day one and prevent structures entering into a state of disrepair years into the future, by incorporating the use of cathodic protection at the design and construction stage.

C-Probe's previous products were specifically for the restoration market, but the MAU is suitable for all new construction projects, including buildings, bridges and car parks, where the reinforcement steel needs protection.

**Features of the MAU**

To install the MAU, it is simply push-fitted to a range of steel diameters, during steel construction. As its name suggests, the wiring between the MAU is also modular and simplifies the electrical installation. Routing of the interconnecting modular wiring can be made at the precast factory in box-outs and completed after delivery to site, making the completion of the installation more efficient.

Installation of the product is also described as 'Plug and Play', as the wiring is routed to the zonal enclosure, with the network routed between enclosures to the Network Access Unit for communication and allowing the client to take control of protection current, which can be altered to different current densities depending on the layout of the reinforcement steel.

The MAU offers sustainable resilience through C-Probe's low carbon alkali activated cementitious geopolymer (LoCem®), which acts as a cathodic protection anode as well as a highly durable cement.

Cement is an essential industry but with Portland cement producing around 8% of harmful global emissions, construction needs to start exploring innovative alternatives and adjusted formulations to drive down emissions.

LoCem® is produced from recycled and waste by-products with no heat (energy) meaning it had a low carbon profile

Installation of an ICCP system at design stages eliminates the need for reconstruction or demolition. Both involve carbon-heavy processes.

Implementing the MAU at the earliest stages also saves tonnes of embodied carbon which is created via the materials and construction processes throughout the whole lifecycle of the structure.

The MAU can be coupled with C-Probe's Achilles Suite of Structural Healthcare Systems, which allows the control and monitoring of the installed MAU and filters the data online. Clients can log into C-Probe's Achilles Interactive Management Server, or AiMS, which takes the structural data and offers clear reporting for performance now and further into the future. Having this data is vital as clients can take preventative action instead of deferring maintenance, the value of the asset is protected, and they have peace of mind that they have a healthy, functional structure for its whole life.

**Long-Term Benefits**

- ESG compliance and low carbon strategy
- Easy and quick installation for a range of concrete structures
- Preservation of tonnes of embodied carbon
- Invaluable structural data to demonstrate performance throughout service life
- Economically protects the structure from day ONE
- Retain asset value for its whole life
- Offsite manufacture of the MAU ensures a more sustainable and efficient approach to construction projects.

Watch our MAU videos at: <https://www.c-probe.com/en/why-locem#20240726>

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# Digital Innovation Winner

## The Community Data Platform Rebuilding Communities with HUMAN, ASSET and ACTIVITY data

Yeme Tech

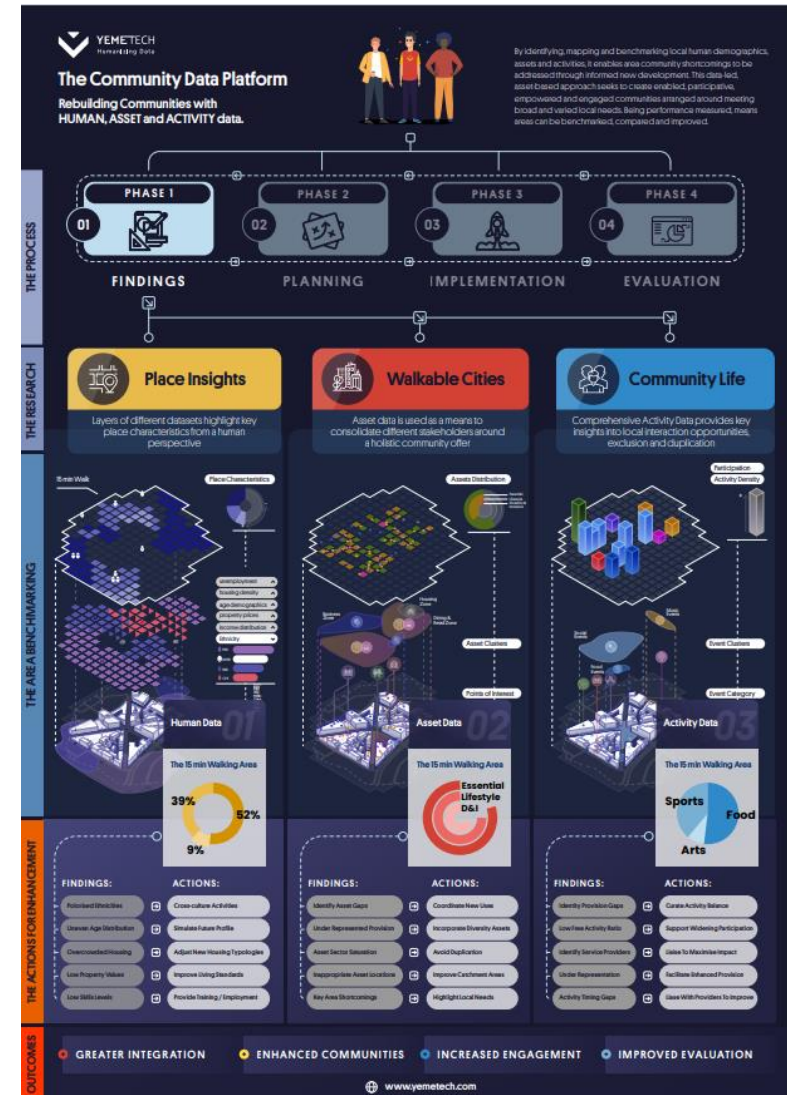
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# Contracting and Construction Management

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# Contracting and Construction Management

Winner

## CONSTRUCTION DIARY

Lois Whitnell

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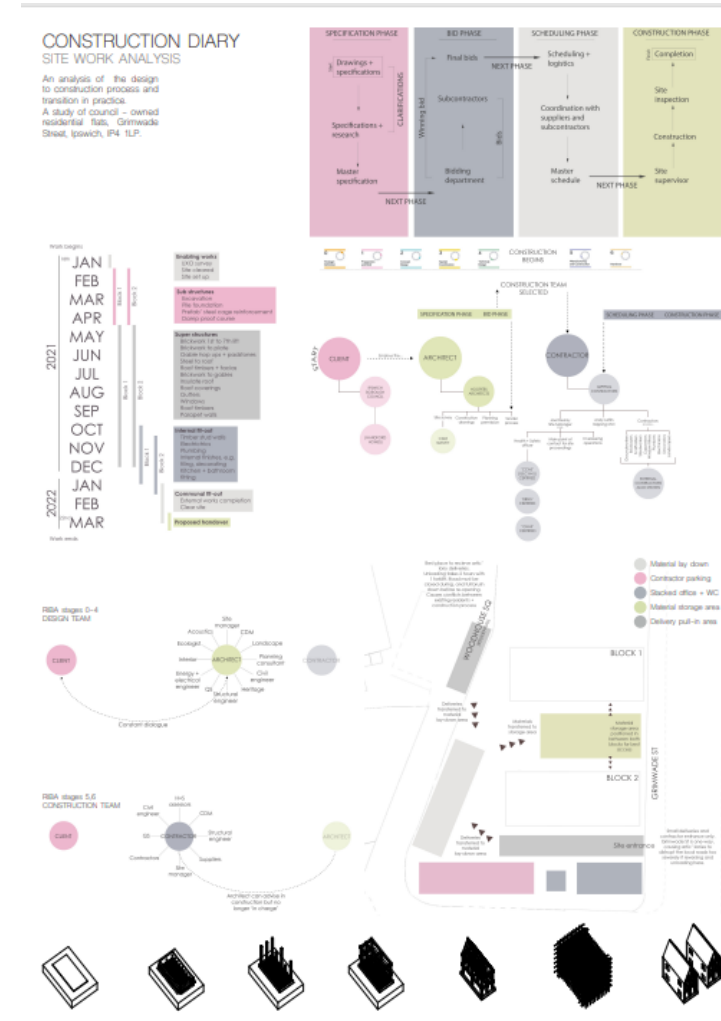


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# Architecture and Architectural Technology

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# Architecture and Architectural Technology

Highly Commended

## QUARRYING RESIDENCIES

Lois Whitnell

## Sustainable Homes Enabling Long Term Empowerment of Refugees

Ahmad Eltaweel

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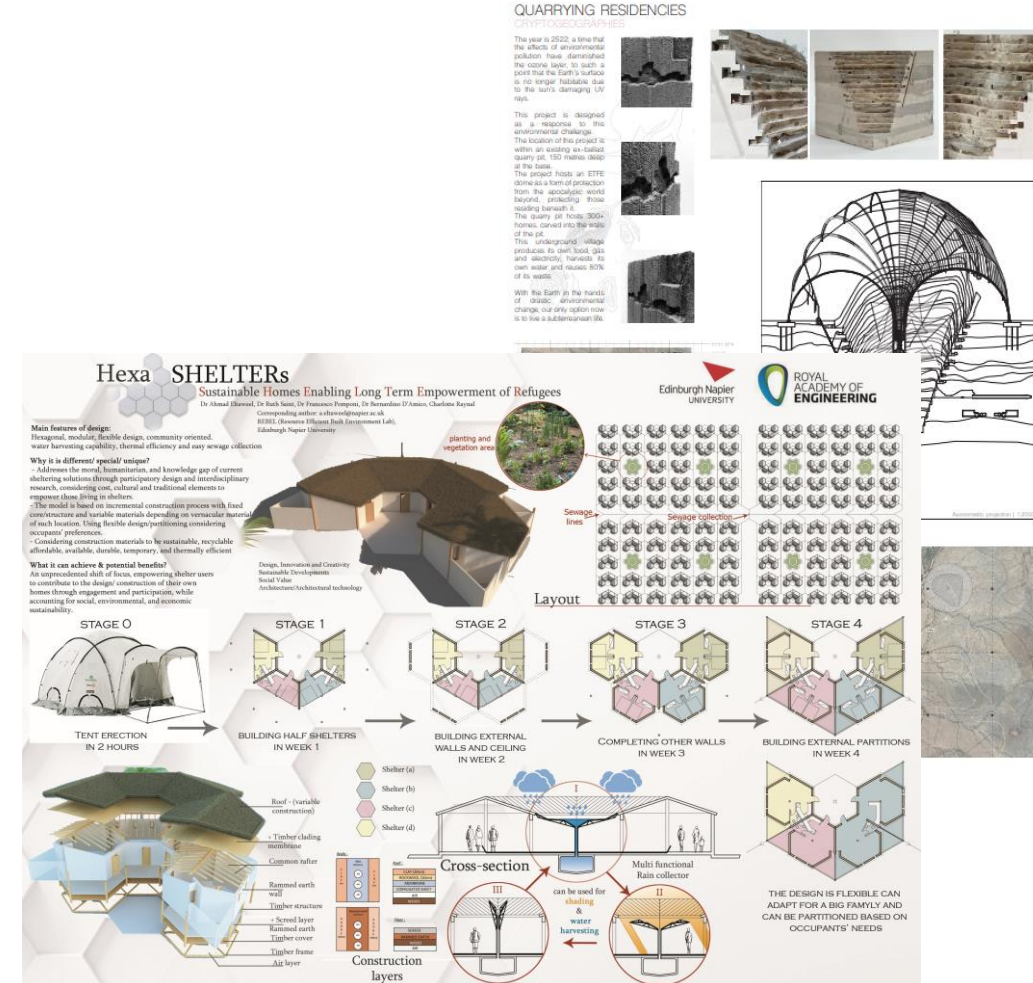


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# Architecture and Architectural Technology

Winner

## NOVAVIDA - Novel Approach for Vital Infrastructure Post Disaster

NOVAVIDA Project – Ornella Iuorio

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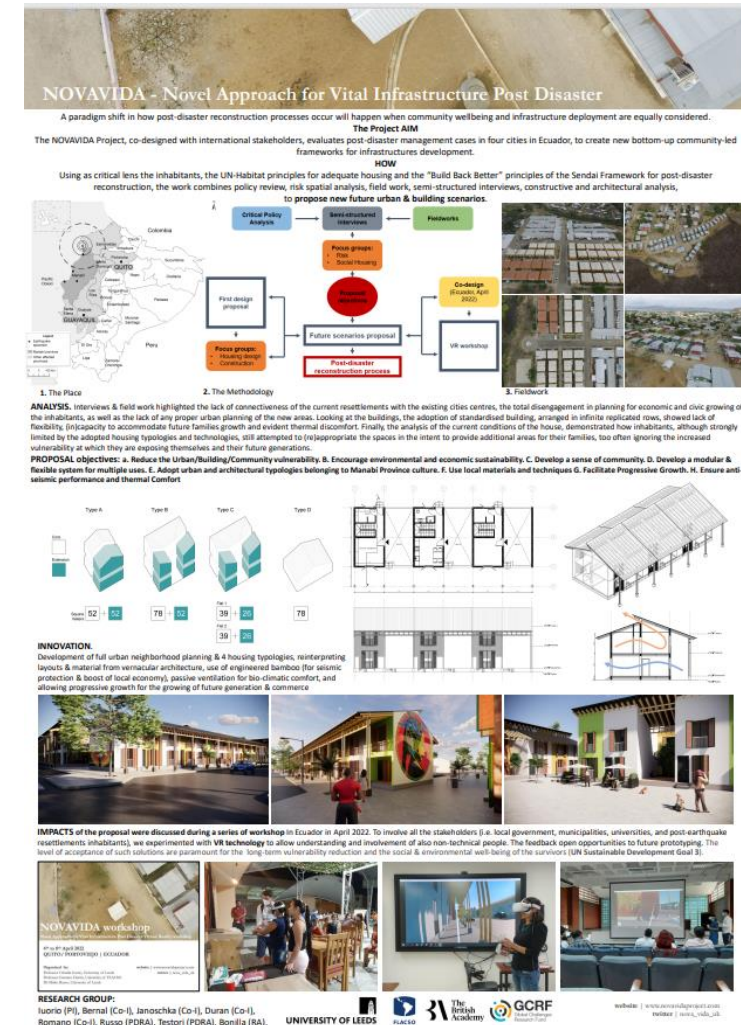


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# Off-site Manufacture

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# Off-site Manufacture

## Highly Commended

How can MMC contractors' business models communicate confidence to public clients?

Ali Saad

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## How can MMC contractors' business models communicate confidence to public clients?

### Promoting the Modern Methods of Construction across the public construction sector

Ali Saad, Leeds Beckett University, School of Built Environment, Engineering and Computing, Leeds, UK

#### Construction topping the list of firm insolvencies Q1 2022

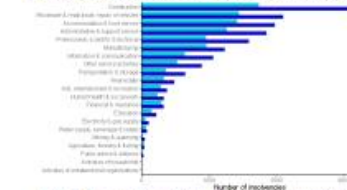


Figure 1: Company Insolvency Statistics - January to March 2022 (Adapted from (The Insolvency Service, 2022))

#### MMC firms impacted by the lag in achieving an economy of scale

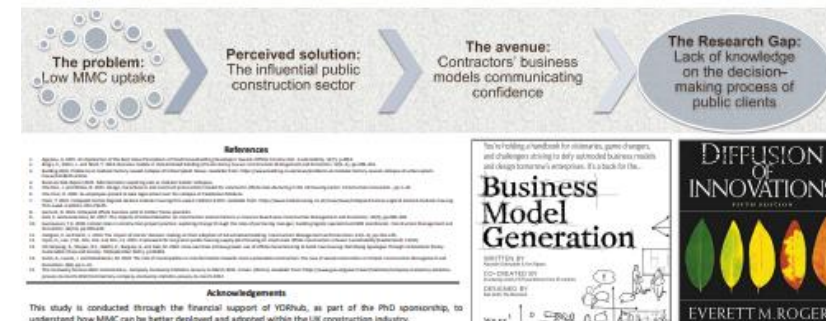
Source	Title
Business Sale Report (2022)	Administrators exploring sale as modular builder collapses
Gerrard (2021)	Collapsed offsite business sold to timber frame specialist
Churcher (2022)	Ex-employees poised to take legal action over the collapse of Caledonian Modular
Building (2022)	Problems at modular factory caused collapse of Urban Splash House
Gardiner (2020)	Ideal Modular undergoes pre-pack administration
Clark (2022)	Collapsed Homes England-backed modular housing firm owed creditors £13m

#### Supervisory team

- Professor Mohammed Dulaimi
- Professor Chris Gorse
- Dr Sam Zulu
- Mr. Fergus Aitken



With the growing rate of insolvencies and the increasing number of MMC firms going into liquidation, research is requested more than ever to investigate the means in which MMC businesses can thrive and enhance their commercial standing. Contractors' business models are perceived as old and inefficient (Goh and Loosemore, 2017). The significance of appropriate business models has been described as the first condition enabling better MMC adoption (Bregre et al., 2014), where existing traditional ones are identified as unviable. The literature herewith emphasises the importance of improving currently utilised models, yet the effective improvements remain uncaptured. This study focuses on special clients rather than generalising the overall research. Knowing that MMC uptake is low in the public sector (Charlson and Dimka, 2021), public clients attain characteristics that can be argued to drive innovation adoption in the whole construction industry due to their unique nature and demand (Hyun et al., 2021). In the construction context, these clients have been described as the 'gatekeepers' in promoting innovation across the industry (Salmi et al., 2022). Enhancing MMC uptake among public clients would therefore influence less dependency from the public sector on conventional methods currently dominating over 70% of all new developments in the United Kingdom (Agapiou, 2021). If these influential organisations adopt MMC as a practical solution, other organisations will follow, thereby accelerating innovation adoption across the construction sector (Ooi-Sarpong et al., 2022). Studies focusing on the public sector described public clients as 'a change-restraining force' for MMC diffusion, calling for research in the same direction (Hedgren and Stehn, 2014, p.143). However, albeit influential in their procurement power, Gustavsson (2018) underlines that change among public clients is not easily achieved. The main question remains; how can MMC contractors reinvent their business models to effectively communicate confidence to public clients towards penetrating the public sector?



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# Off-site Manufacture Winner

## INCREASING THE WOOD BENEFITS: THERMAL BRIDGES ANALYSIS FOR WELSH TIMBER FRAMED CONSTRUCTIONS Zaccaro Francesco

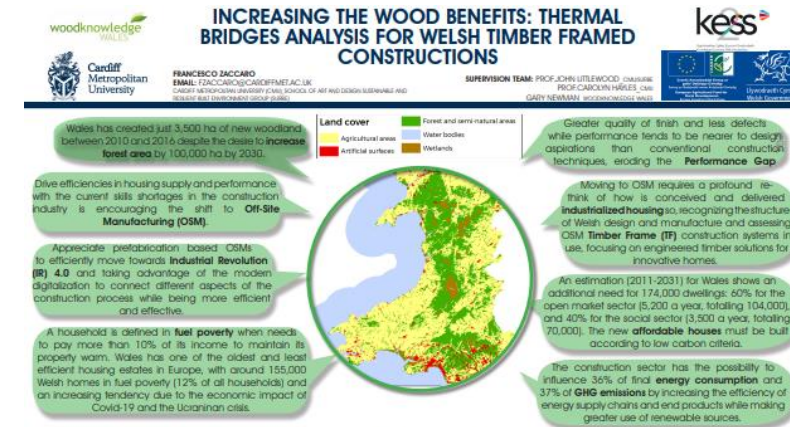
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Building designed for high-performance with fabric first approaches include high level of airtightness and insulation to drastically reduce the energy losses are caused by heat transfer through building components and **Thermal Bridges (TB)**. TBs have increased their importance on the total **Heat Losses (HL)** and, for this reason, the thermal properties evaluation requires an higher and more sophisticated level of accuracy increasing the product volume and quality of construction systems supplied from Welsh manufactures while exploring opportunities to increase standardization of solutions to improve cost-performance is the objective of the research. This is the fundamental to satisfy all the needs mentioned above.

The investigation aimed at the evaluation of the impacts on thermal transmittance of repetitive thermal bridges, both from **Timber Frame Fraction (TFF)**, defined as the amount of timber element short-circuiting the main insulation layer - and metal fastenings to address the next development of high-performance timber constructions for **Registered Social Landlords (RSLs)** by using numerical simulations and global sensitivity analysis.

**Phase One:** The exploration of the TFF considered five dwelling typologies and a total of 266 closed frame panels from the Welsh manufacture have been evaluated based on construction drawings to determine the total TFF and its on U-values, separating off-site from on-site framing amount while contextually distinguishing the non-repeating and repeating fraction. This last amount is calculated by excluding the TF elements already part of linear TB calculations to avoid double counting of heat losses.

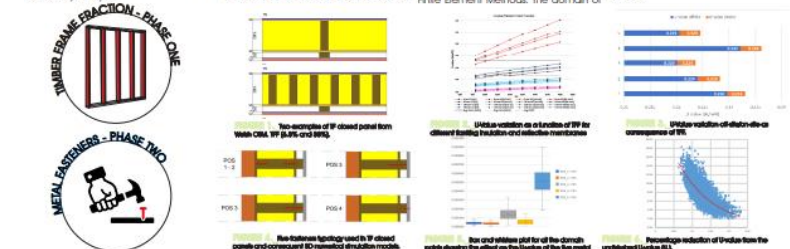
The results show that the connection typology used to join two consecutive closed panels on-site requires further timber elements that impact the U-value and feed into the PG between manufacture production and final building application. The simplified U-value calculation method for non-homogeneous constructions demonstrates that high TFF affects negatively the U-value, especially when no or low flanking insulation thickness is included in the construction built-up while the overall thermal transmittance is smaller when a thicker flanking insulation is adopted. Results reveal also that the use of reflective materials on the external insulation or in the service

gap reduces the U-value, however their beneficial effect is reduced with high-performance constructions.

**Phase Two:** Metal fasteners, nails and screws used by the OSM for quick installation of framing elements and consecutive layers is also analysed. The use of fasteners is rarely seen as an issue and often undervalued because the connection used do not pierce the insulation layer (exception made of the flanking insulation retainer), connecting the cold with the warm side of the construction. However, metal is a higher conductor of heat when compared with the other homogeneous materials used in the TF construction and as such creates an increase of heat losses.

A TF construction typology from Welsh manufacture was abstracted from an industry standard construction by parametricising a design variables including geometrical (flanking and core insulation thickness), material properties (flanking, core insulation and fastener thermal conductivity) and reflective layers service air void and external layer of the flanking insulator) with an objective function, the point TB is defined. The rankings produced from the manufacture about the magnitude of the point TB and instruct about the relevance of each design variable when defining a TF construction.

Finally, it has been evaluated the total contribute of each of the five fastener typology, considering their relative density on meter square basis. The incremental U-value contribute of the point thermal bridges could span from 2% to 18%, with an average of 7.6%. However, the general trend shows that the lower the U-value, the more important is the effect of the point TB. It is necessary to consider carefully the variation of TFF and the use of fasteners, especially when more tight regulations will impose strict U-values and it will be impossible to ignore those aspects.



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# Zero Carbon

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# Zero Carbon Highly Commended

## ENERGY SORTED AT TIDYCO LTD

TIDYCO LTD

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## ENERGY SORTED AT TIDYCO LTD



© Tidyco Ltd

### About the business

Tidyco is a Derby-based manufacturing and engineering business which supplies hydraulic and pneumatic components to the UK rail industry. They also have a climate control division that designs and installs innovative industrial heating and air conditioning systems.

The company exports globally to around 50 countries.

### Why did you engage with DE-Carbonise?

Tidyco identified a business case for becoming more energy-efficient and has made an ongoing commitment to becoming low carbon by investing in measures to reduce its energy consumption and carbon emissions. The firm previously invested over £100,000 in a 50kWp solar photovoltaic (PV) system, to meet some of the company's electricity demand from renewable solar energy. The system produces over 38,000kWh of electricity per year, saving 20 tonnes of carbon emissions.

An audit as part of the first phase of the project identified an opportunity to make significant cost and energy savings by upgrading the lighting in their premises. The company received a grant of £16,000. Each year, this investment in LED lighting saves twelve tonnes of carbon emissions. When the company expanded into an adjoining unit in 2021, they contacted the DE-Carbonise team to ascertain how best to make it energy efficient.

### What has been the impact of working with DE-Carbonise?

The initial assessment of the new unit resulted in a grant of £11,082 towards more efficient heating and sensor-controlled, dimmable LED lighting saving 7.6 tonnes of carbon annually.

The company applied for a second grant from the project and were awarded £15,423 towards the cost of installing a 46.6kWp solar photovoltaic system on their new unit.

The energy efficient and energy generating measures fitted to the new unit save Tidyco over £11,000 per year and reduce their annual carbon emissions by 16 tonnes. The entire site,

comprising three different units, now has LED lights controlled by daylight and movement sensors.

The company also invested in a programmer for LED panels in all their offices, to adjust the lighting level to suit individual staff and business activities in different areas.

"Tidyco has a more efficient lighting system using 60% less energy so it's win-win all round" said Philip Mason, Production Director.

This year, the company achieved the ISO 14001 Environmental Management Standard accreditation and attributed their success in part to the assistance that the DE-Carbonise project provided.

Philip Mason, Tidyco's Production Director, stated: "So far, we have managed to introduce packaging recycling, EV charging points, solar panels, and LED lighting. This has only been possible through the technical and financial support from Derby City Council's DE-Carbonise initiative to whom we owe a debt of gratitude."

The company has also entered the electric vehicle sector, by training staff to install electric vehicle charge points and by fabricating metal EV charge point protection barriers.

### Next steps

The company will continue to work to maintain their ISO 14001 accreditation and to implement further carbon and resource saving measures within its site and business activities as opportunities arise.

### Data

#### Grant 1

- Annual Energy Saving (kWh): 35,880
- Annual Carbon saving (KgCO<sub>2</sub>e): 7,567
- Annual Cost Saving: £2,931
- Value of Grant: £9,081.82

#### Grant 2

- Annual Energy Saving (kWh): 36,702
- Annual Carbon saving (KgCO<sub>2</sub>e): 8,483
- Annual Cost Saving: £6,871
- Value of Grant: £15,423.02



[derby.ac.uk/decarbonise](http://derby.ac.uk/decarbonise)



# Catalina Giraldo-Soto



**UWE Bristol** University of the West of England

# University of Suffolk



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## References

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# Chairs Commendation for outstanding work in Building and Surveying – Energy.

Highly Commended

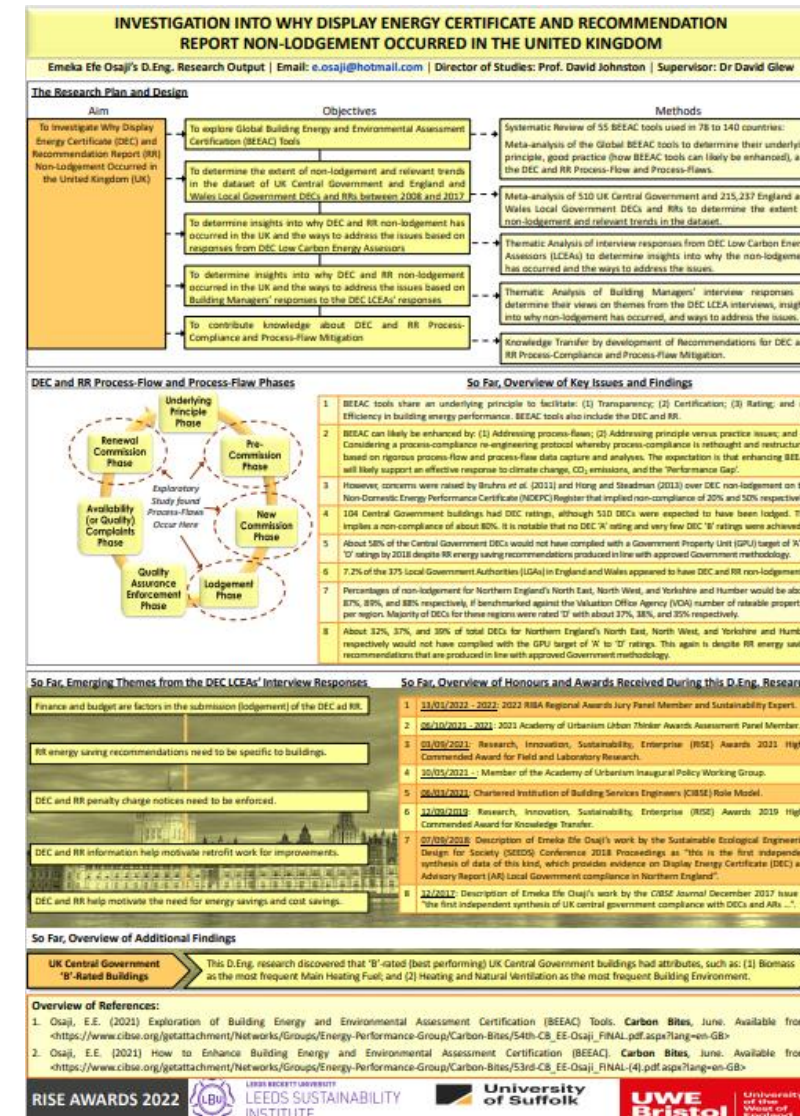
## INVESTIGATION INTO WHY DISPLAY ENERGY CERTIFICATE AND RECOMMENDATION REPORT NON- LODGE OCCURRED IN THE UNITED KINGDOM

Emeka Efe Osaji

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# Robert Ellis Special Award

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# Robert Ellis Special Award Winner

## APPRENTICESHIPS: HOW CAN THEY SUPPORT SUSTAINABLE ORGANISATIONAL MANAGEMENT? WITH A FOCUS ON DEGREE APPRENTICESHIPS

Josie Rothera – PI Projects

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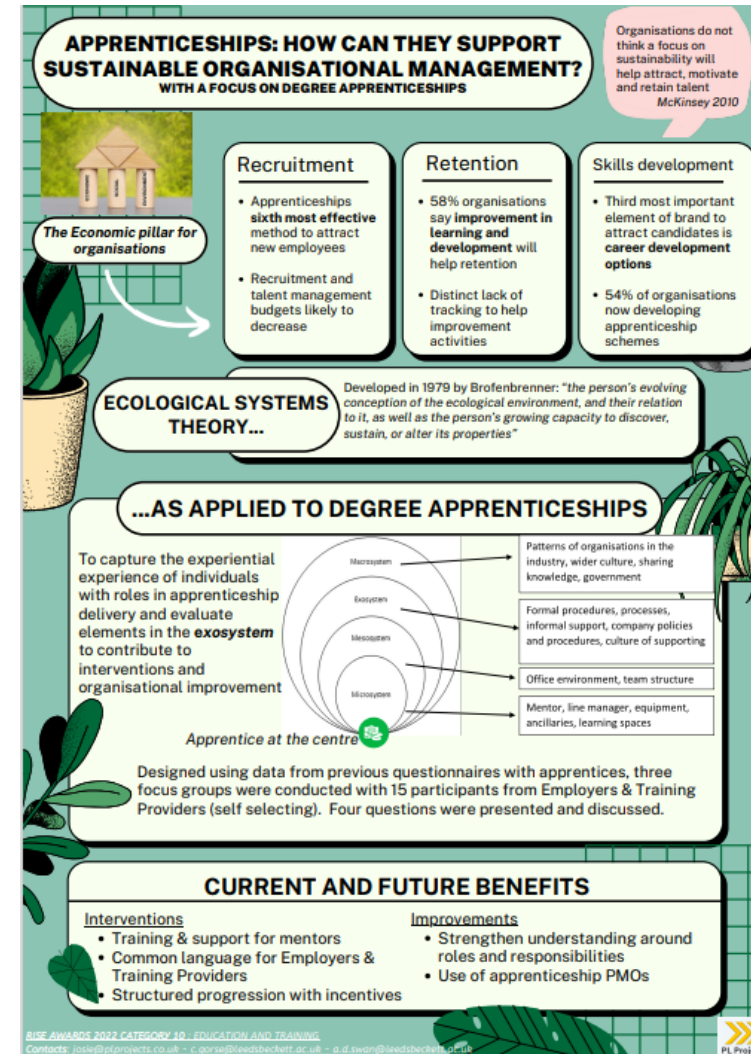


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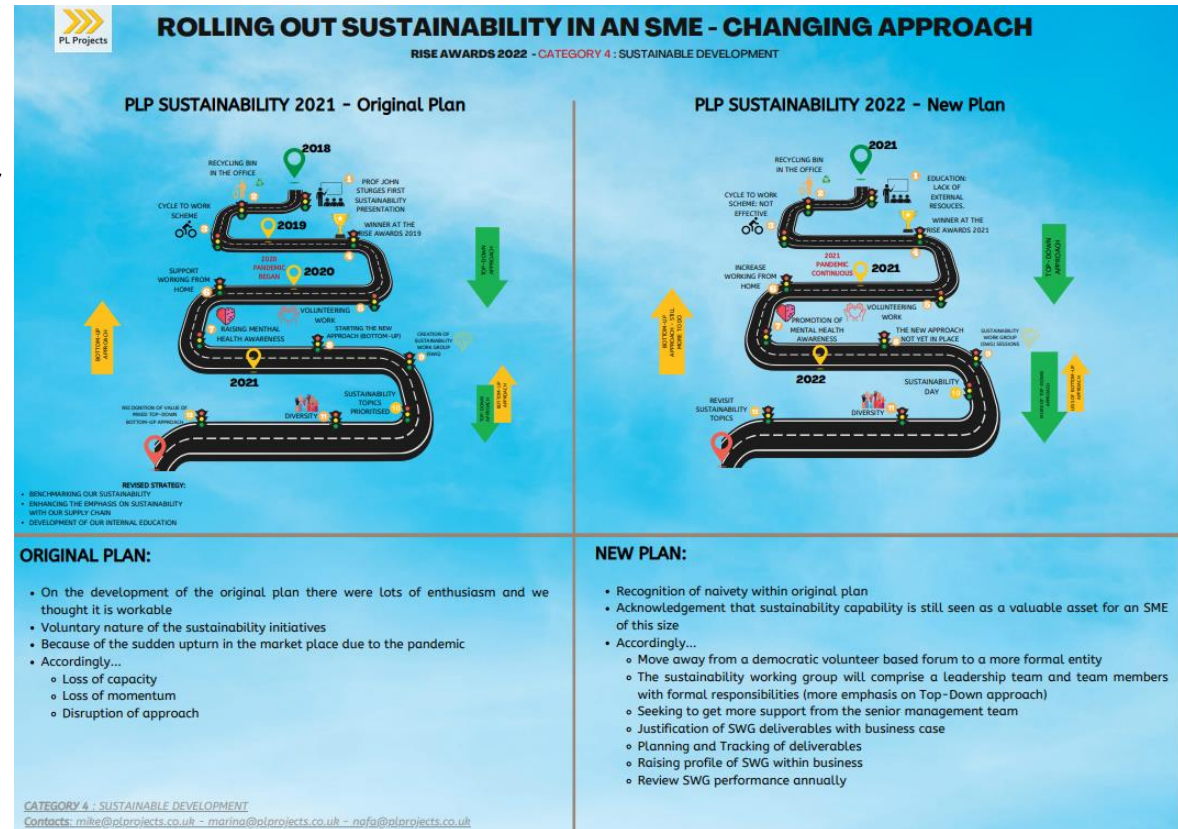
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## ROLLING OUT SUSTAINABILITY IN AN SME - CHANGING APPROACH

Nafa Duwebi – PI Projects



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# John Sturges Special Award

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# John Sturges Special Award Winner

## Assessing the feasibility of Sustainable drainage systems in informal settlements to treat new and emerging pollutants

Peter Hollings

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### Assessing the feasibility of Sustainable drainage systems in informal settlements to treat new and emerging pollutants

**Peter Hollings<sup>1\*</sup>, Sue Charlesworth<sup>2</sup>, Anna Bogush<sup>2</sup>, and Paul Griffiths<sup>2</sup>**  
<sup>1</sup>Centre for Agroecology, Water and Resilience, Coventry University, CV3 3LG, United Kingdom  
<sup>2</sup>Research Centre for Fluid and Complex Systems, Coventry University, CV1 5FB, United Kingdom  
\*Contact email for more information: [hollings@uni.coventry.ac.uk](mailto:hollings@uni.coventry.ac.uk)

**Project Context:**  
Nearly 1 billion people worldwide live in informal settlements (Kamilpour et al. 2016), where residents lack permission to build or live on the land and the settlements lack central planning or oversight.  
Informal settlements also lack drainage, meaning wastewater is simply thrown away. This wastewater contains many pollutants not usually monitored for such as medicines and drugs, household cleaning chemicals, and microplastics. These pollutants are also capable of causing environmental damage, even at levels as low as billionths of a gram.


**Project aims:**  
- Assess the feasibility of nature based solutions to remove non-traditional pollutants.  
- Examine the potential for South African plants used in nature based solutions to have secondary benefits (such as providing food, medicine, or material).  
- Examine the performance of novel materials, that are cheap and readily available, following a South African case study.

**Why a South African case study?**  
South African apartheid left insecure land rights and a lack of housing, key reasons for the proliferation of informal settlements. Additionally, due to AIDS, the country is the largest consumer of antiretrovirals (Abale et al. 2018) meaning pharmaceutical pollution in wastewater is a key issue.  
Furthermore, nature based solutions have been investigated at "The Water Hub" in Langrug, an informal settlement near Cape Town, with which this project has a link, but investigation of new and emerging pollutants has not yet been possible. Previous work also showed that engaging residents' involvement is a key requirement for long term success of the nature based solutions (Winter 2016).




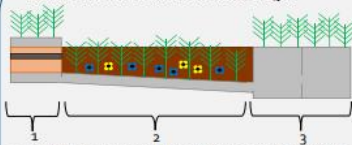
The poor drainage infrastructure present in Langrug, South Africa.

**Current Experimental work:**  
Over late Summer and early Autumn 2021, a pilot trial was undertaken to investigate the potential for biochar, a charcoal like material, to uptake a range of over the counter medicines and antibiotics alongside plants. Samples are currently being analysed.




**Upcoming experimental work:**  
Column experiments for examining the ability of cheap and sustainable novel materials to take up medicines, drugs, and household chemicals.



**Planned Nature Based Solution Design:**  


- 1 - A planted slow sand filter containing a layer of biochar. Surrounded above and below by gravel to facilitate drainage.
- 2 - A vegetated channel with check dams to move outflow from the slow sand filter away. Contains gravel to enclose standing water.
- 3 - A "constructed wetland" to treat the water. This box will hold the water for a time to allow plants and microbes to remove and break down pollutants.

**Analysis Methods:**  
- Liquid chromatography tandem mass spectrometry (LC/MS) for analysis of pharmaceutical drugs and similar compounds.  
- Fourier transform infrared (FTIR) microscopy for analysis and photographing of microplastics.  
- Inductively coupled plasma optical emission spectroscopy (ICP-OES) for analysis of elements, including metals.  
- Flow injection analyser (FIAstar) for analysis of nutrients.



Current construction progress at CAWR, Ryton as of 2022. There will be 3 planted and 3 unplanted control systems.  
Plants used will be local to South Africa and able to provide additional benefits in line with project aims.

Providing additional benefits to informal settlement residents gives them a stake in the system and a reason to maintain it. Without this it is likely any potential system would fall into disrepair.

**References:**  
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# John Sturges Special Award Winner

## DELIVERING A LOWER CARBON REALITY FOR SUSTAINABLE CONSTRUCTION

Brett Martin

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### DELIVERING A LOWER CARBON REALITY FOR SUSTAINABLE CONSTRUCTION

**Brett Martin**

#### THE NEED

25 per cent of the UK's total greenhouse gas emissions are attributable to the built environment. Greenhouse gases are emitted at every stage of the construction and use cycle, from the manufacture of materials through construction and maintenance to eventual demolition. Emissions from the built environment must be reduced if the UK is to meet net zero by 2050. More pressing, the UK's Sixth Carbon Budget requires carbon emissions to be reduced by 78 per cent by 2035.\*

Government now realises that the focus to date has been entirely on "Operational carbon" emissions resulting from energy consumption in the day-to-day running of a property. Now the focus is broadening to include "Embodied Carbon" emissions generated from the production of building materials, the construction process, plus the maintenance and demolition of buildings. The major challenge for the industry's leading manufacturers is to accelerate the development of construction products which reduce both Operational and Embodied carbon.

\*House of Commons Environmental Audit Committee Building to net zero: meeting carbon in construction. Final Report of December 2020. 28

UK EMISSIONS

#### THE RESPONSE

Brett Martin is one of the UK's leading producers of specialist plastic building materials. Our drive towards carbon neutrality is a complex multi-faceted project which targets carbon reductions across our energy use, material content, transport impacts, circularity and innovation.

##### MEASUREMENT

Measurement is the first stage of management and Brett Martin has invested in Planet Mark certification to establish our 2021 Carbon baseline as the first stage of a transparent, accountable approach to our net zero journey in a five-step process: Measure, Engage and Communicate.

As a result of rigorous measurement, our commitment to improvement is driving engagement of our stakeholders in the process, enabling us to communicate our progress with confidence, transparency and enthusiasm.

##### CRADLE TO GRAVE

**Supply Chain**

- The vast majority of raw materials are sourced from UK, Europe and USA.
- We use suppliers who comply with environmental standards and good practice.

**Production & Logistics**

- We use high-grade and efficient materials handling to minimise waste.
- All packaging we use is 100% recyclable.
- Our transport fleet vehicles are being converted to hybrid or electric where possible.

**End of Life**

- We do not make products for short-term use.
- Our construction products are designed to perform for decades.
- All of our thermoplastic products are easily recycled at end of life.

##### ENGAGEMENT

Everyone in the business plays a part in reducing our carbon impact. By communicating progress via "We Care" updates, Brett Martin is informing staff and customers alike so we can guide them to the most beneficial choices to reduce the industry's carbon impact.

##### ENERGY

Brett Martin has set new standards in the building materials industry for investment in on-site and dedicated production of renewable energy. A 96m high, 3.1MW wind turbine is embedded in our Macclesfield site and supplemented by our solar PV system, contributing to a **1732t annual saving of CO<sub>2</sub>**.

Our energy efficiency programme is driven by a planned roll out of energy use monitoring by production machines and the upgrading to best in class energy efficient technology.

##### INNOVATION

In May 2022 we launched BioPlus, our first bio-based Polycarbonate glazing product which replaces over 70% of the fossil-based material with bio-sourced materials, mostly sourced from used cooking oil. The new material production process reduces carbon emissions by 34% and Brett Martin will make the product with 100% renewable energy in a more balanced process, certified by SCC Plus.

This unique approach represents a new level of carbon efficiency for the industry. Our Bio Plus Martin Clima glazing system delivers exceptional U values of 0.24W/m<sup>2</sup>K in double glazing units with up to 46% light transmission. When combined with our bio-based technology this product reduces both embodied and operational carbon while retaining high levels of design flexibility.

##### CIRCULAR ECONOMY

The recycling of plastic is a topical issue and the development of innovative processing is accelerating. Brett Martin is committed to transitioning production to the use of recycled materials whenever possible and today processes more than 350 tonnes of recycled polymer. In addition, the company recycles 99.3% of waste production material waste back into the product stream.

Storamate is an innovative non-woven membrane product produced with 100% recycled Polypropylene polymer. A great example of an innovative environmental protection system utilising sustainable manufacturing methods and energy.

CONGRATULATIONS TO ALL OUR WINNERS

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