

# Workshop: Introducing Zero Carbon Construction Sites (WIZCS) Report

By Apollo Tutesigensi dated 31  
March 2017

**EPSRC**

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## **INTRODUCTION**

### **Background to WIZCS**

In May 2016, a research grant application was submitted to the Engineering and Physical Sciences Research Council (EPSRC) in the United Kingdom by Dr Apollo Tutesigensi (as principal investigator) to fund a two-day workshop, in conjunction with the University of Leeds. The workshop was entitled 'Workshop: Introducing Zero-carbon Construction Sites (WIZCS)'.

The proposal for the workshop was based on the idea that the construction phase of construction projects presented an unexplored area of investigation with respect to reducing carbon emissions. The workshop was primarily designed to respond to this perceived gap in the body of knowledge and introduce the idea of zero carbon construction sites and plan the agenda for the diffusion of the idea, via a zero carbon construction sites scheme, as a means of facilitating a step-change in reduction of carbon emissions in the construction industry.

In early September 2016, EPSRC announced that WIZCS would be funded and preparations got underway. The research grant was to run over a period of 3 months and it was agreed that it would start on 1 January 2017 and finish on 31 March 2017.

### **Purpose of WIZCS**

WIZCS was designed to bring together researchers interested in the intersection between construction site operations and zero/low carbon energy. It was envisaged that the researchers would include specialists in construction management, wind energy and solar energy and other low carbon or non-fossil fuel energy technologies as well as specialists in policy design and formulation. Moreover, the workshop would bring these researchers together to interact with construction contractors and research and technology organisations as well as governmental and quasi-autonomous non-governmental organisations in order to define the research agenda about achieving zero carbon construction sites.

## **Organisation of WIZCS**

In accordance with the programme in the application and agreed milestones, the two days of the workshop were scheduled for 8 March 2017 and 23 March 2017 at Weetwood Hall, Leeds, UK.

A time interval of 15 days was included between the two workshop days to enable participants to reflect deeply on the issues discussed on the first day and consult with colleagues in their organisations before reconvening for the second day to confirm the commitments to the initiative and agree the plans for post-workshop activities. During the interval, the principal investigator kept in touch with the participants and addressed any emerging queries and collated emerging ideas for discussion on the second day.

A dedicated website was created to publicise the workshop and an animation and a logo were commissioned to be produced in the first couple of weeks of January 2017. These activities were undertaken with the help of a research administrator from the Faculty of Engineering Research and Innovation Services at the University of Leeds. The logo was used on the website and the animation was unveiled on 8 March 2017 as part of the opening statement by principal investigator.

The administration tasks such as marketing, registration and booking venues for WIZCS were supported by an experienced team of event managers in the Faculty of Engineering's Continuing Professional Development (CPD) Unit. Having the workshop administration tasks undertaken by specialist event managers released the principal investigator to concentrate on subject matter issues.

## **Invitation to WIZCS**

Due to the specialist nature of the issues pertinent to WIZCS, a targeted invitation (as opposed to completely open invitation) strategy was adopted. After careful consideration of potential delegates, the principal investigator invited over sixty potential delegates to WIZCS from five categories: academic researchers, construction contractors, local government, central government, research and technology organisations and quasi autonomous non-governmental organisations (quangos). The potential delegates were

encouraged to distribute and/or forward the invitation to their colleagues for whom they felt the issues were relevant.

An indication of the number of people invited from the different categories is provided below:

- academic researchers - invitations were sent to four individuals, nineteen members of the Management Committee of the Association of Researchers in Construction Management, three distribution lists at the University of Leeds (covering researchers in energy, environment and physical technologies) and one international distribution list of the co-operative network of building researchers;
- construction contractors - fifteen individuals from twelve construction contracting organisations based in the Yorkshire and Humber Region were invited;
- local government - fourteen senior officers in the constituent councils of the West Yorkshire Combined Authority (Her Majesty's Government, 2014) were invited;
- central government - invitations were sent to five senior officers from the Department of Transport, Highways England, Department for Business, Energy and Industrial Strategy, Department for Environment, Food and Rural Affairs as well as to the organisations' helplines;
- research and technology organisations - from a list of 57 research and technology organisations in UK (Association for Innovation, Research and Technology Organisations, 2017), five (BRE, BSRIA, CIRA, Horiba Mira and WMG HVM Catapult) were found to be the most appropriate and invitations were sent to nine senior officials from the five organisations; and
- quangos - from a list of 463 quangos in UK (Cabinet Office, 2016), four (Committee on Climate Change, Council for Science and Technology (CST), Environment Agency and Innovate UK) were found to be the most appropriate and invitations were sent to the CST helpline and six senior officials from the other three quangos.

## **Attendance at WIZCS**

There were eleven participants at WIZCS on the first day as follows:

- five academic researchers with research interests in solar energy, wind energy, biofuels, construction management and sustainable construction;

- two senior managers of two construction contracting organisations – the individuals were responsible for environment and sustainability in their respective organisations;
- one senior officer from central government's Department of Business, Energy and Industrial Strategy;
- one senior manager from a large public sector client organisation responsible for environment and sustainability;
- one student undertaking a research project in carbon capture technology on construction sites; and
- one research administrator with knowledge about funding for research in UK.

There were seven participants at WIZCS on the second day as follows:

- three academic researchers with research interests in solar energy, wind energy, construction management and sustainable construction;
- one Director of a construction consulting organisations – with previous work experience with construction contracting organisations in UK and mainland Europe;
- one senior manager from a large public sector client organisation responsible for environment and sustainability;
- one student undertaking a research project in carbon capture technology on construction sites;
- one research administrator with knowledge about funding for research in UK;
- apologies (and contributions in writing) were received from one senior manager in a construction contracting organisation responsible for environment and sustainability; and
- apologies (and contributions in writing) were received from one academic researcher with research interests in sustainable construction.

The disadvantages of a smaller than anticipated number of participants were outweighed by the deep interest and knowledge the few participants brought which led to exciting and productive discussions over the two days of WIZCS.

## **OUTPUTS OF WIZCS**

### **Conclusions of WIZCS**

The presentations and discussions held on 8 and 23 March 2017 led to the following conclusions.

1. There is growing interest in reducing carbon emissions of construction sites (CEoCS) across government, industry and academia but the interest is not widespread.
2. From a construction industry perspective, action to reduce CEoCS is often limited by lack of solutions to the barriers faced.
3. Actions to facilitate reduction of CEoCS in the short, medium and long term are urgently required.
4. Since different organisations will be interested in different time frames, it is important to avoid a 'one-size-fits-all' mentality when seeking solutions to the challenges of reducing CEoCS.
5. The idea of zero carbon construction sites (ZCCS) is timely and has the potential to accelerate and spread reduction of CEoCS.
6. The realisation of ZCCS should be driven by a broad ZCCS Initiative (ZCCSI).

### **Objectives of ZCCSI**

The objectives of ZCCSI should be to:

1. define ZCCS;
2. document the barriers/challenges to reducing CEoCS;
3. develop solutions to the barriers/challenges to reducing CEoCS;
4. diffuse solutions to the barriers/challenges to reducing CEoCS;
5. develop a measurement framework for ZCCS performance at project level; and
6. develop evidence-based protocols to promote reduction of CEoCS.

The pursuit of the objectives of ZCCSI should take cognisance of and build on:

1. the work of organisations such as:
  - United Kingdom Green Building Council (UKGBC)
  - Green Construction Board (GCB)
  - European Network for Construction Companies for Research & Development (ENCORD)
  - World Green Building Council (WGBC)
  - CDP Worldwide
  
2. publications such as:
  - *Construction 2025* (Her Majesty's Government, 2013)
  - Green Construction Board's *Low Carbon Routemap for the Built Environment* (Green Construction Board, 2013)
  - ENCORD's *Construction CO<sub>2</sub>e Measurement Protocol* (ENCORD, 2012)
  - Chartered Institute of Building's *Carbon Action 2050 Toolkit* (Chartered Institute of Building, No Date)
  - Delos Living LLC's *The Well Building Standard* (Delos Living LLC, 2017)
  - British Standards Institute's *BS EN ISO 14064 – 1: 2012; Greenhouse gases - Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals* (British Standards Institution, 2012a)
  - British Standards Institute's *BS EN ISO 14064 – 2: 2012; Greenhouse gases - Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements* (British Standards Institution, 2012b)
  - British Standards Institute's *BS EN ISO 14064 – 3: 2012; Greenhouse gases - Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions* (British Standards Institution, 2012c)
  
3. industry systems such as:
  - BREEAM
  - CEEQUAL
  - Leadership in Energy and Environmental Design (LEED)
  - Green Star
  - Considerate Constructors Scheme (CCS)
  - BAM's Sustainability Measurement and Reporting Tool (BAM SMaRT)

## **Post-WIZCS Activities**

It was agreed that the following activities would be undertaken after WIZCS:

1. introducing and disseminating the ZCCSI;
2. applying for funding for a ZCCS research network;
3. applying for funding for a 'ZCCS Challenges and Opportunities Repository' research project; and
4. preparing research grant application(s) to develop better understanding and solutions for specific ZCCS challenges.

## **BUILDING ON WIZCS**

### **Introducing and disseminating ZCCSI**

There is need to take the ZCCSI to main stream literature and bodies of knowledge to shine light on it as an endeavour in which everyone is invited to participate. This will be pursued by targeting trade, professional and academic periodicals such as:

1. Construction News
2. New Civil Engineer
3. Construction Manager
4. Building
5. The Construction Index
6. Proceedings of Institution of Civil Engineers - Management, Procurement and Law
7. Proceedings of Institution of Civil Engineers - Energy
8. Proceedings of Institution of Civil Engineers - Engineering Sustainability

### **Applying for funding for a ZCCS research network**

The ZCCS Network will be comprised of pioneers of ZCCSI from among WIZCS participants and others already and to be identified who were unable to attend WIZCS. The network's activities will be aimed at:

1. providing a forum to incorporate stakeholder opinions in the area of capital carbon emissions reduction in the civil engineering and building sectors;
2. increasing public understanding of the importance of construction sites in reducing capital carbon emissions;
3. stimulating knowledge transfer between industry, academia, government and other stakeholders; and
4. identifying and promoting future ZCCS research and development requirements based on partner contributions.

### **Applying for funding for a 'ZCCS Challenges and Opportunities Repository' research project**

There is immediate need for research to establish and publish the challenges faced by construction organisations when seeking to reduce CEoCS. Publishing the challenges will be an invitation to everyone to develop solutions.



There is also immediate need to identify opportunities available from within and outside the construction industry that can enable construction organisations reduce CEoCS.

It is envisaged that this research project will entail, but not be limited to, the following:

1. working with construction and building contractors to create a training programme for ZCCS analysts;
2. deploying ZCCS analysts to document ZCCS challenges and opportunities;
3. creating an online repository of ZCCS challenges;
4. creating an online repository of ZCCS opportunities;
5. identifying external drivers for ZCCS;
6. developing standards for ZCCS; and
7. creating a training programme for construction professionals to become ZCCS analysts.

A consortium of research project partners is already starting to form.

### **Preparing research grant application(s) to develop better understanding and solutions for specific ZCCS challenges**

A number of immediate challenges relating to CEoCS were identified. These include, but are not limited to, the following:

1. plant idling;
2. heating and drying on construction sites;
3. plant logistics on construction sites;
4. power generator set technology;
5. delivery logistics on construction sites;
6. alternative technologies for construction plant;
7. impact of battery technology on ZCCS;
8. impact of offsite manufacturing on ZCCS; and
9. impact of ZCCS on air quality.

A consortium of research project partners is already starting to form and a long list of potential industrial partners has been compiled.

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