UNIVERSITY OF LEEDS

CANDIDATE BRIEF

Research Fellow in Complex Systems Modelling: Circular Economy for Post-Demolition Concrete, Faculty of Engineering & Physical Sciences

Salary: Grade 7 (£33,797 - £40,322 p.a.) Due to funding restrictions, an appointment will not be made higher than £38,017 p.a.

Reference: EPSCV1028

Closing date: 31 January 2021

Fixed-term for 22 months (full-time), to start on 08 February 2021 or thereafter. A part-time appointment at 80% FTE can also be considered.

We will consider flexible working arrangements

Research Fellow in Complex Systems Modelling: Circular Economy for Post-Demolition Concrete, School of Civil Engineering.

Are you an enthusiastic and motivated researcher with an interest in modelling circular economy complex systems? Do you have a highly numerate background and experience in modelling system-wide complexity? Are you experienced in data analytics coding in R or similar packages? Do you want to further advance your career in one of the UK's leading research-intensive Universities, as part of a new cross-disciplinary centre for circular economy?

The School of Civil Engineering are looking for a dynamic and dedicated individual to conduct research about assessing and modelling the circularity of post-demolition concrete as part of complex material flow systems. This role is part of a new UKRI Interdisciplinary Circular Economy Centre on Mineral-based Construction Materials. This exciting and influential collaboration with five other academic partners and a large group of external stakeholders, aims to support the transition to a Circular Economy for construction materials in infrastructure.

Construction is one of the top 3 sectors of the UK economy. It is responsible for 8% of GDP and 10% of both UK employment and greenhouse gas emissions. Construction materials are by far the largest material resource flow globally. In the UK, we use them at a rate of more than half a million tonnes per day, and they comprise more than 60% of UK waste. Meanwhile, new infrastructure, as a proportion of total new construction, has doubled over the past 20 years, and the National Infrastructure & Construction Pipeline projects £600 billion investment in infrastructure over the next 10 years. Yet the construction industry faces serious challenges with accessing materials while also reducing its greenhouse gas emissions and other environmental impacts.

We are therefore collaborating with world-leading experts at the University College London, Universities of Loughborough, Sheffield and Lancaster, the British Geological Survey, and a network of national and international stakeholders from across the construction industry, to provide leadership in this sector. Our research in support of a Circular Economy for built environment infrastructure in the UK will be undertaken by 15 multidisciplinary research groups, each anchored around a postdoctoral research project. Overall, the academic collaboration will involve at least 25 world-class academics, 15 postdoctoral researchers, and 30 doctoral students and 30 MSc

students, representing more than 15 disciplines. All our activities will be undertaken in interaction with a dynamic Stakeholder Interest Group of more than 100 members, representing the whole value chain and life cycle for construction materials. Our exciting programme of work will lead to actionable solutions that will create economic value from minimising use of energy and virgin raw materials, and progress towards the United Nations Sustainable Development Goals. The portfolio of activities will have a total budget of more than £8M.

Your role in conducting complex systems circularity assessment and optimisation for concrete obtained from demolition operations will be at the core of one of the 15 research groups in this prestigious collaboration. Working as part of a team, including specialists in this field from the University of Leeds Circular Economy and Resources Recovery network (CERRY), the Neville Centre of Excellence in Cement and Concrete Engineering and industrial stakeholders, you will have primary responsibility for conducting a twenty-two month programme of work that has been designed in collaboration with the wider research teams. The academic research is expected to be followed by a one-year placement with an industrial partner, for practical implementation of the academic findings.

What does the role entail?

Concrete comprises 60% of more than 30Mt per annum of the UK's demolition waste. While >90% of this material is recovered, this statistic hides poor circularity credentials. Since the vast majority of this material is downcycled; there is a necessity "*to move this up the waste hierarchy into higher value reuse and recycling applications*". A variety of technical solutions exist, mainly focussed on maximising coarse recycled concrete aggregate (RCA) content. In this context, Leeds' complex value optimisation for resource recovery (CVORR) methodology can be used to extend the standard LCA capability beyond standard environmental aspects. The research will develop and demonstrate a method that is applicable beyond mineral-based construction materials to all resource types, creating a generic prototype circular economy model, incorporating system complexity.

To address this need, as a Research Fellow you will:

- Be responsible for the delivery of the specific outcomes on data gathering and creating a quantified complex systems model and its visualisation;
- Review the technical assessment of all products from demolished concrete, and use it as a basis to maximise circularity of these materials;

- Describe the possible fates of these products using systems engineering;
- Understand and map the flows of materials, including products losses and contaminant emissions, across the system, using stakeholder inputs;
- Develop scenarios for demolition concrete circularity using statistical approaches on data, such as probabilistic systems descriptions or artificial intelligence (AI) using for example machine learning algorithms;
- Incorporate the above into a CVORR (Complex Value Optimisation for Resource Recovery) model to assess potential circular economy scenarios.

It is expected that the Research Fellow will:

- Advise and contribute to discussions regarding research by other members of the wider team, including other Research Fellows, Doctoral and Masters students;
- Participate in the organisation of, and present their work at, quarterly meetings and workshops;
- Participate in formal quarterly research group meetings (as well as more frequent informal meetings), and preparing quarterly reports according to the funding requirements;
- Take a lead role in advising and mentoring at least two undergraduate or Masters' projects, whose objectives will support those of the postdoctoral research project;
- Lead preparation of journal papers (e.g., about the CVORR systems modelling method application in the minerals sector and the case study), and assist in the preparation of related research-led teaching material and policy briefings.

These duties provide a framework for the role and should not be regarded as a definitive list. Other reasonable duties may be required consistent with the grade of the post.

What will you bring to the role?

As a Research Fellow you will have:

- A PhD (or have submitted your thesis before taking up the role) in a relevant field e.g. (environmental) data analytics, process engineering, systems modelling or complexity science OR a Masters degree with at least four years of relevant experience;
- Excellent understanding and experience of applied statistical data analytics (such as machine learning, AI algorithms);

- Good experience with coding (e.g. R/Python/Matlab) for complex systems modelling (such as environmental-human interaction systems);
- Strong analytical, creative and problem-solving skills with an ability to respond creatively to resolve unanticipated challenges;
- Excellent IT skills in Microsoft Office including Outlook, Excel, Word and MS Teams;
- Good time management and planning skills, with the ability to meet tight deadlines and work effectively under pressure;
- A proven track record of peer-reviewed publications in high impact factor journals;
- Excellent written and verbal communication skills including presentation skills;
- Proven ability to manage competing demands effectively, responsibly and without close support;
- A proven ability to work well both individually and in a team;
- A strong commitment to your own continuous professional development;
- An understanding of and commitment to the principles of the Circular Economy and the United Nations Sustainable Development Goals.

You may also have:

- Experience of pursuing external funding to support research;
- Excellent understanding and experience with application of material flow analysis or process flows or life cycle assessment;
- Good understanding and experience with properties of construction materials and their environmental performance.

How to apply

You can apply for this role online; more guidance can be found on our How to Apply information page. Applications should be submitted by **23.59** (UK time) on the advertised closing date.

Contact information

To explore the post further or for any queries you may have, please contact:

Dr Costas Velis, Lecturer in Resource Efficiency Systems, School of Civil Engineering
Email: C.Velis@leeds.ac.uk

Additional information

Faculty and School Information
Further information is available on the research and teaching activities of the Faculty of Engineering & Physical Sciences, and the School of Civil Engineering.

A diverse workforce

The Schools in the Faculty of Engineering & Physical Sciences are proud to have been awarded the Athena SWAN Bronze or Silver Award from the Equality Challenge Unit, the national body that promotes equality in the higher education sector. Our equality and inclusion webpage provides more information.

Working at Leeds
Find out more about the benefits of working at the University and what it is like to live and work in the Leeds area on our Working at Leeds information page.

Candidates with disabilities
Information for candidates with disabilities, impairments or health conditions, including requesting alternative formats, can be found on our Accessibility information page or by getting in touch with us at disclosure@leeds.ac.uk.

Please note: If you are not a British or Irish citizen, from 1 January 2021 you will require permission to work in the UK. This will normally be in the form of a visa but, if you are an EEA/Swiss citizen and resident in the UK before 31 December 2020, this may be your passport or status under the EU Settlement Scheme.

Criminal record information

Rehabilitation of Offenders Act 1974
A criminal record check is not required for this position. However, all applicants will be required to declare if they have any 'unspent' criminal offences, including those pending.

Any offer of appointment will be in accordance with our Criminal Records policy. You can find out more about required checks and declarations in our Criminal Records information page.