



## **School of Computing, Engineering, and the Built Environment Edinburgh Napier University**

### **PHD STUDENT PROJECT**

#### **Application instructions:**

Detailed instructions are available at :

<https://www.napier.ac.uk/research-and-innovation/doctoral-college/how-to-apply>

*Prospective candidates are encouraged to contact the Director of Studies (see details below) to discuss the project and their suitability for it.*

### **Project details**

#### **Supervisory Team:**

- DIRECTOR OF STUDY: Dr Timothy Olawumi (Email: [t.olawumi@napier.ac.uk](mailto:t.olawumi@napier.ac.uk))
- 2<sup>ND</sup> SUPERVISOR: Dr Bernardino D'Amico

**Subject Group:** Built Environment

**Research Areas:** Architecture, Building & Planning (Built Environment)

**Project Title:** Decarbonising the Construction Industry through Supply Chain Optimisation and Circular Economy Strategies

#### **Project description:**

The construction industry is a significant contributor to global greenhouse gas emissions, with a substantial carbon footprint stemming from material extraction, production, transportation, construction, operation, and end-of-life disposal. Addressing this challenge requires a systemic approach that integrates sustainability principles throughout the entire construction supply chain. This research aims to develop a comprehensive framework for decarbonising the construction industry by optimising supply chain operations and implementing circular economy strategies.

The project will investigate the potential of circular economy principles, such as material reuse, recycling, and remanufacturing, to reduce the industry's carbon emissions. It will explore innovative approaches to material procurement, logistics, and waste management, focusing on minimising resource consumption and maximising material recovery. Additionally, the research will develop optimisation models to

identify the most efficient and low-carbon supply chain configurations, considering factors such as transportation distances, energy consumption, and material sourcing.

By combining supply chain optimisation and circular economy principles, this research seeks to create a roadmap for the construction industry to achieve significant carbon reductions while enhancing resource efficiency and economic viability. The findings will inform policymakers, industry practitioners, and researchers in developing effective strategies for decarbonising the built environment.

This project offers an exciting opportunity to contribute to the global effort to combat climate change by addressing the significant carbon footprint of the construction industry. By developing innovative solutions that combine supply chain optimisation and circular economy principles, the successful candidate will have a profound impact on the built environment and future generations.

### References:

1. Akinade, O. O., Oyedele, L. O., Ajayi, S. O., Bilal, M., Alaka, H. A., Owolabi, H. A., & Arawomo, O. O. (2018). Designing out construction waste using BIM technology: Stakeholders' expectations for industry deployment. *Journal of Cleaner Production*, 180, 375-385.
2. Ghisellini, P., Ripa, M., & Ulgiati, S. (2018). Exploring environmental and economic costs and benefits of a circular economy approach to the construction and demolition sector. A literature review. *Journal of Cleaner Production*, 178, 618-643.
3. Leising, E., Quist, J., & Bocken, N. (2018). Circular Economy in the building sector: Three cases and a collaboration tool. *Journal of Cleaner Production*, 176, 976-989.
4. Oluleye, B. I., Chan, D. W. M., Antwi-Afari, P., & Olawumi, T. O. (2023). Modelling the principal success factors for attaining systemic circularity in the building construction industry: An international survey of circular economy experts. *Sustainable Production and Consumption*, 37, 268-283. <https://doi.org/10.1016/j.spc.2023.03.008>
5. Oluleye, B. I., Chan, D. W. M., & Olawumi, T. O. (2022). Barriers to circular economy adoption and concomitant implementation strategies in building construction and demolition waste management: A PRISMA and interpretive structural modeling approach. *Habitat International*, 126(April), 102615. <https://doi.org/10.1016/j.habitatint.2022.102615>
6. Oluleye, B. I., Chan, D. W. M., Olawumi, T. O., & Saka, A. B. (2023). Assessment of symmetries and asymmetries on barriers to circular economy adoption in the construction industry towards zero waste: A survey of international experts. *Building and Environment*, 228(November2022),109885. <https://doi.org/10.1016/j.buildenv.2022.109885>
7. Oluleye, B. I., Chan, D. W. M., Saka, A. B., & Olawumi, T. O. (2022). Circular economy research on building construction and demolition waste: A review of current trends and future research directions. *Journal of Cleaner Production*, 357(July),131927. <https://doi.org/10.1016/j.jclepro.2022.131927>

## **Candidate characteristics**

### **Education:**

Minimum 2:1 degree in the following subject areas - Construction Management, Civil Engineering, Architectural Engineering, Supply Chain Management, Environmental Science/Engineering, Business Management or any related discipline

### **Subject knowledge:**

Supply chain management principles, Sustainability and circular economy concepts, Life cycle assessment methodologies, Optimisation modelling techniques, Construction Materials and Methods, Data analysis and statistical methods

### **Essential attributes:**

- Strong analytical and problem-solving skills
- Good research and writing abilities
- Proficiency in data analysis and statistical software (e.g., SPSS, R, or any relevant one)
- Ability to work independently and collaboratively
- Interest in sustainability and environmental issues

### **Desirable attributes:**

- Experience in the construction industry
- Knowledge of building information modelling (BIM)
- Proficiency in programming languages (e.g., Python, Java or any relevant ones)
- Knowledge of relevant policies and regulations in construction and waste management
- Positive, passionate, team player, hardworking, and self-motivated