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Editorial

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Editorial

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This issue contains three papers that present insights on and research into a range of topics, including the utilisation of building information modelling (BIM) to reduce waste from using steel reinforcement, a successive pro-environmental behaviour framework, and a model for estimating construction waste generation in masonry building.

In this issue, the first paper is written by Chidambaram (2019), and it was collected for the themed issue on BIM for waste and resource management, which was initiated jointly by Dr Zhen Chen at the University of Strathclyde, Prof. Jacqueline Glass at University College London (UCL), Ms Gilli Hobbs and Mr Sean McCormick at the Building Research Establishment (BRE) Limited in 2017. With regard to the Waste and Resources Action Programme (Wrap) guidance on resource-efficient construction (Mactavish *et al.*, 2013), the call for papers for the themed issue aimed to promote and support the adoption of BIM in resource use optimisation, and waste and resource management in buildings and civil infrastructures; and it provided several proposed topics, including

- best-practice case studies on BIM-integrated waste and resource management
- BIM-integrated design justification, construction management and facilities management towards waste reduction and resource use optimisation
- BIM-integrated environmental risk assessment
- BIM-oriented stakeholder and supply network integration for waste and resource management
- BIM pervasive policy, strategy and implementation, including procurement and contracts, for waste and resource management
- BIM to support greater reuse and recovery from demolition/deconstruction.

I would like to take this opportunity to acknowledge colleagues who have strongly supported this themed issue in the past 2 years. It is expected that more papers may come for

publication regarding new knowledge and solutions achieved from both research and practice in relation to the use of BIM to improve resource efficiency.

For the implementation of BIM to reduce waste in construction projects, Chidambaram (2019), from WS Atkins in India, presents a novel BIM-integrated approach to managing effectively reinforcement information for fabrication and construction. The author describes a digital reinforcement-modelling process based on a practice-oriented literature review. This process is extensively discussed in relation to the causes of reinforcement waste, and solutions through the application of BIM. The extensive discussion is well structured to focus on the following ten highly relevant issues

- reinforcing steel congestion
- reinforcement clashes
- design errors and frequent design changes
- limited use of design standardisation
- improper material transportation, storage and handling
- lack of prefabrication strategies
- lack of collaboration
- detailing inconsistencies and estimation errors
- lack of rebar optimisation
- lack of modern method of reinforcement fabrication.

As highlighted by the author, this paper explores potential ways through the adoption of BIM to reduce waste from using steel reinforcement in construction, and this can well inform further research, development, and practice.

While it has been found, according to some previous research into pro-environmental behaviour in the construction sector (Huang *et al.*, 2014; Jones *et al.*, 2016), that professional knowledge and competence as influence factors are significantly notable, Tavri (2019), from Kingston University in UK, introduces a successive pro-environmental behaviour framework called 'CEBA' to fill the value action gap (VAG).

The framework is identified and discussed in four categories – communication, engagement/action, behavioural maintenance, and avoidance (CEBA) – in the context of waste and resource management in construction. In order to establish the new theoretical framework, there has been an extensive review of the literature, which was carefully selected through the use of a snowball sampling method, and in-depth discussions on the interdependency and connectivity among CEBA categories and their variables, which consist of social, economic, cultural and technological factors. Based on a series of feasibility oriented examinations, it was concluded that the CEBA framework is a useful analytical tool for investigating the mechanisms of and barriers to re-use at the organisational level. In relation to the use of quantitative approaches to waste and resource management in construction (Chen and Li, 2006), the CEBA framework introduced here by Tavri (2019) demonstrates the potential of the new theoretical method for environmental performance enhancement.

Nagalli and de Carvalho (2019), from the Federal University of Technology – Paraná (UTFPR) in Brazil, describe a predictive waste-generation model, which has been used to estimate the quantity of construction waste for masonry building projects in Curitiba, Paraná, Brazil. This prediction model was established through a regression analysis based on data collected from 48 construction projects undertaken by 11 builders working in the municipality of Curitiba. This analysis covered several key parameters in relation to the generation of construction waste on site, and these include

- work execution time
- total constructed area
- the type of masonry
- team training and monitoring.

It has been found from the experimental case studies that this model can provide good results for projects when the total construction area is larger than 4000 m², and the average error associated with its predictions was 29.8%. Under the complex situation of waste generation from construction projects, the empirical modelling as presented in this paper is always a useful approach to prediction that can effectively support decision-making and activities of waste and resource management. In comparison with other types of prediction models

developed through the use of different techniques such as gene expression programming (Wu *et al.*, 2015) and big data analysis underpinned by graph processing and BIM (Bilal *et al.*, 2016), the empirical modelling approach with reliable observations and comprehensive data collection on-site across prefabrication, construction and deconstruction may further support more accurate predictions for design and construction towards resource efficiency.

It is expected that readers could find these papers stimulating and informative, and provide comments for further discussion. Thank you.

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