

## **The role of the client to enable circular economy in the building sector**

Katherine Tebbatt Adams<sup>1</sup>, Mohamed Osmani<sup>2</sup>, Tony Thorpe<sup>3</sup> and Gilli Hobbs<sup>4</sup>

<sup>1,2,3</sup> School of Civil and Building Engineering, Loughborough University, Loughborough, LE11 3TT, UK; E-mail: k.adams@lboro.ac.uk

<sup>4</sup> Building Research Establishment Ltd, Garston, Watford, WD25 9XX, UK

### **Abstract**

Whilst there is an increasing recognition of the circular economy concept within the building sector, opportunities for its implementation at project level remain largely underexploited. Research has shown that challenges to its uptake include limited knowledge and awareness among stakeholders; a fragmented supply chain; an unclear business model and financial case; and a lack of incentives to implement circular economy in building projects. Whilst these challenges are present across the construction supply chain, clients have a pivotal role in addressing them and driving the shift towards circular economy from project inception to completion. As such, clients can progress a number of enabling factors for the uptake of circular economy, including the implementation of innovative business models, whole life thinking, information sharing, facilitating supply chain collaboration and establishing a clear vision. This paper focuses on the role of the client in enabling a circular economy within the building sector by analyzing data obtained from a supply chain workshop on the critical success factors for implementing the circular economy. Supporting actions of the construction supply chain are also discussed. The results indicate that whilst a client can be influential in applying circular economy principles with a resulting reduction in material usage and waste generation through setting suitable conditions within the procurement process such as requirements for material efficiency, support from the construction supply chain is required to enable this to happen.

**Keywords:** circular economy, building sector, client, supply chain, critical success factors.

### **Introduction**

The 'circular economy' concept is becoming more common across a variety of industries, including the building sector, with the goal of moving away from a linear model of 'take, make, dispose' to a circular one where material resources are kept for future use, preferably at the highest economic value possible. This is an important aim in the building sector whereby a large amount of waste is generated together with high material resource usage (DEFRA 2016; de Koning et al. 2013). Even though much of this waste is recovered in the UK, much of it is downcycled, where the value, quality and functionality are lower than the original product (Walsh 2012; Sassi 2008).

The circular economy concept can be applied at a number of levels within the building sector: asset (building), component, product and due to the diversity of the sector, different approaches and solutions are required, which may vary across the building's lifecycle. For example, at the design stage, aspects such as adaptability should be considered to extend the functional life of a building and the inherent resources within; design for deconstruction which may enable the future reuse of components and products should also be explored. At the construction stage, aspects such as procuring reused and high recycled content products to create demand, returning surplus products and waste to the manufacturer and the use of circular business models for producer responsibility should be investigated. Commonly,

circular economy aspects are often applied in isolation in construction projects and lack wide scale adoption (Adams et al. 2017).

Studies have shown various challenges for the building sector in adopting a circular economy including the fragmented nature of the construction industry, an unproven business case, lack of interest and awareness and an unproven business case (Adams et al. 2017; UKCG 2015, Schult et al. 2015). A common factor in overcoming many of these challenges is the role of the client who can be a major force in ensuring circular economy outcomes at a project level. Whilst, there has been research undertaken on the role of the clients to enable improved economic and sustainability project outcomes (Häkkinen & Belloni 2011; BIS, 2013), there has been less so in the arena of circular economy.

## **Methodology**

A supply chain workshop was held in December 2016 with the aim to investigate the ‘critical success factors’ for embedding circular economy within the building sector. There were 25 attendees (5 x client; 4 x designer; 7 x manufacturer; 5 x contractor; 2 x demolition; 2 x other) and the workshop was divided into two sessions. For the first session, attendees were grouped into their respective supply chain roles and based on their role, asked to identify the critical success factors which will create a functioning circular economy in the building sector. The groups were asked to prioritize the identified CSFs and provide feedback to the whole group. For the second session, the attendees were grouped into a typical supply chain and asked what actions are needed and by whom to implement the identified CSFs. The CSFs identified at the workshop in the first session have been analyzed and synthesized.

## **Results and Discussion**

Table 1 shows the CSF’s identified by clients at the workshop. Most important was the need for a Government mandate in the form of legislation or policy to act as a driver for circular economy, similar to the requirement by the English Government to require BIM on certain projects. However it was noted, that this would likely be a long term ambition and therefore the need for a business case was seen a paramount. This includes understanding the financial costs and benefits of circular economy approaches and where the value lies within the supply chain and when it may arise. Some of this information will need to come from the supply chain in providing an evidence base for a product or solution and its performance in use as well as aligning it to the end-user and the market offering. The business case may vary depending on the type of end-user and their drivers; for example an owner-occupier is likely to have a longer-term viewpoint than an end-user that is leasing short-term. The role of the supply chain was considered as a CSF with the need for buy-in to enable innovation; however the client needs to ensure that they create the right climate for this to occur such as long term frameworks and partnering along with the acceptance of any potential risk. Warranties and assurance of performance was a continuing theme. A key issue for the client was the requirement for any circular economy solution not to impact on cost or the construction program – this is where whole life value needs to be considered. Interestingly, a CSF identified by the supply chain was the need for a clear vision and strategic objectives to enable circular economy thinking; however this was not raised as an issue by clients.

**Table 1:** CSF's identified by the clients

CSFs	Main issues from a client perspective
Policy and legislation	<ul style="list-style-type: none"> <li>• Enable change through policy and mandates e.g. such as BIM</li> <li>• Desire to have new policy and legislation to compete with linear economy</li> </ul>
Business case including value	<ul style="list-style-type: none"> <li>• Requirement to demonstrate the financial benefits; needs to pay back</li> <li>• Evidence to be aligned with the end-user</li> <li>• Need to understand what the market wants</li> </ul>
Supply chain	<ul style="list-style-type: none"> <li>• Supply chain buy in</li> <li>• No impact on construction programme</li> <li>• Any procedures fitted into the existing development processes</li> </ul>
Technical	<ul style="list-style-type: none"> <li>• Performance and assurance issues - building and component</li> <li>• Long term warranties/ performance guarantees</li> </ul>
Cultural	<ul style="list-style-type: none"> <li>• Issues of acceptability of reused/recycled products</li> <li>• Improved awareness, knowledge and skills</li> </ul>
Data, evidence, quantification	<ul style="list-style-type: none"> <li>• Empirical evidence that the concept works and is supported with benefits show</li> <li>• Known routes for recovery/reuse</li> </ul>
Vision and strategic objectives	<ul style="list-style-type: none"> <li>• Strong desire for clarity by the client on project vision and strategic objectives from rest of the supply chain</li> <li>• Circular economy objectives need to be there at the start</li> <li>• Enabling factor for the rest of the supply chain (e.g. allowing manufacturers to invest)</li> </ul>

## Conclusion

The importance of embedding a circular economy in the building sector should not be underestimated. There are different approaches and levels of applications, due to the diversity of the sector and those organizations who work in it. The client has a key role in overcoming a number of the challenges for adoption at a project level including providing enabling conditions for collaboration and innovation across the supply chain and the sharing of data. One of the most important CSFs identified by others in the supply chain is the need for greater clarity of the client's vision and strategy with long-term thinking; however there is a disconnect here, with the client not recognizing this as a major factor. To enable the client to have a pivotal role, support is needed from the rest of the supply chain such as the provision of new business models, evidence of the benefits of circular economy applications, technological innovation and provision of performance information and assurance. The next stage of this research is to use these CSFs to develop a strategic framework for embedding a circular economy in the building sector in the UK.

## Acknowledgements

The authors would like to thank all the attendees at the supply chain workshop and BRE Trust for providing funding for the project.

## References

- Adams, K., 2014. CD&E waste: halving construction, demolition and excavation waste to landfill by 2012 compared to 2008; 2008-2013 Five years of focus on waste - achievements and changes (Report 023).
- Adams, K.T. et al., 2017. Circular economy in construction : current awareness , challenges and enablers. *ICE Proceedings Waste And Resource Management*, pp.1–11.
- BIS (Department for Business Innovation and Skills), 2013. *Supply Chain Analysis into the Construction Industry A Report for the Construction Industrial Strategy Supply Chain Analysis into the Construction Industry – A Report for the Construction Industrial Strategy. BIS Research Paper No. 145*, London.
- DEFRA, 2016. *Digest of Waste and Resource Statistics – 2016 Edition (revised)*, London.
- Häkkinen, T. & Belloni, K., 2011. Barriers and drivers for sustainable building. *Building Research & Information*, 39(3), pp.239–255.
- de Koning, A., Eisenmenger, N. & van der Voet, E., 2013. *Topical Paper 1 : Resource-efficiency in the built environment - a broad-brushed , top-down assessment of priorities Scenarios and Options towards a Resource*, Brussels: European Commission.
- Sassi, P., 2008. Defining closed-loop material cycle construction. *Building Research & Information*, 36(5), pp.509–519.
- UKCG, 2015. Developing the circular economy for UK construction Ref 005. UKCG, London
- Walsh, B., 2012. *Construction & Demolition Sector, Module L2m5-1 in WR1403 – Business Waste Prevention Evidence Review*, London.