

***Theoretical Underpins of Lean Construction for Environmental Sustainability in  
the Built Environment of Developing Economies***

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**Abstract**

One of the key global concerns for sustainability is to achieve environmental sustainability. According to earlier studies achieving environmental sustainability is attainable mainly through sustainable activities in the built environment, particularly in developing economies where not much has been achieved. Thus, this study robustly reviews the theoretical discourse that underpins Lean Construction. The potentials Lean Construction (LC) has towards advancing and for achieving environmental sustainability are highlighted and presented in this study. This is particularly important for the developing countries where construction activities contribute greatly to their development and economic growth. More so that, earlier studies have shown that the construction industry has the capacity to proffer solutions for environmental sustainability where rightly guided. Furthermore, LC has been noted to be advancement and a sustainable strategy over the traditional unsustainable construction processes and practices of the built environment. Additionally, LC has been acknowledged to manage and guide the processes of building designs, construction and practices, in order to add value and reduce waste in construction activities. The study also suggests areas of future research involving the formulation of a framework to guide design and construction activities for sustainable development.

Keywords: built environment, lean construction, sustainability

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## **Introduction**

One of the key global concerns for sustainability is to achieve environmental sustainability. This is because researchers have noted that developmental activities within the built environment has contributed significantly to climate change, environmental pollution and natural resource depletion (IPCC, 2007; Atkinson 2008; Surenran and Sekar, 2010; WRI 2016). Thus, the construction industry poses a major challenge to achieving sustainability in the built environment (IPCC, 2007; Wenger, 2012; WRI, 2016). Yet, the solutions lays with the professions within the built environment to practice their profession sustainably (Akadiri et al., 2012; Jagger et al, 2013) and for the advancement of research in this regard is encouraged (WRI, 2016). It has also been observed that i the developing economies and particularly in the Sub-Saharan African (SSA) economies, research towards the promotion of environmental sustainability seem to be limited (Laryea, 2011; Allu, 2014). Additionally, Research has also shown that the application of sustainability concepts is questionable in SSA due to constrained knowledge and capacity of built environment stakeholders (Ebohon et al, 2013; Emuze et al., 2013). This gap needs to be closed. This is because the knowledge and capacity of practitioners within the construction sector is very important (Idoma and Mohammad, 2013).

Elsewhere research has advanced in the construction sector, which is the most active activity in the built environment towards lean principles and strategies for construction deliverables. Hence, the aim of this review is to highlight the importance of lean construction towards the promotion of environmental sustainability within the developing economies of the Sub-Saharan African region.

## **Lean construction**

The construction sector deliverables are mainly the products of the processes from design and construction. As such, in this study construction sector is viewed as the activities of pre-design, design and the construction products which forms the built environment. Furthermore, in this study Learn construction is viewed as sequential activities from project initiation through all applicable processes that leads to the assembling of infrastructures within the built environment using the techniques of lean applications.

Lean construction (LC) principles and techniques involve the entire processes and stakeholders in the construction industry and is also seen as the supplement to the traditional construction management (Abdelhamid, 2007). LC aims at managing and improving design and construction processes in favour of value creation and waste elimination (Koeskela et al., 2003, Abdelhamid et al., 2008; Issa, 2013; Jamil and Fathi 2016). Despite these potentials of LC, the developing economies and particularly the Sub-Saharan countries have been noted to also have their limitations in research and the capacity to apply new innovations (Allu, 2014; Ebohon et al, 2013; Emuze et al., 2013).

However, Leimeister (2010) has early argued that given the strategic pathway, Africans have the potential to carry out what is needful for the actualization of a sustainable built environment. From the attributes of LC presented in the preceding

paragraph has presented the opportunity to actualized and promote a sustainably built for the built environment professionals in the SSA economies

### **Lean Construction and environmental sustainability**

Lean Construction (LC) has the potential to move the construction industry forward sustainably. This has been acknowledged by Marhani et al. (2012). The study conducted by Issa (2013) concluded that LC approaches and techniques can be adopted and applied by developing economies to improve construction activities. Furthermore, LC involves the entire processes and stakeholders in the construction industry and is also seen as the supplement to the traditional construction management (Abdelhamid, 2007). LC aims at managing and improving design and construction processes in favour of value creation and waste elimination (Koeskela et al., 2003, Abdelhamid et al., 2008; Isa et al., 2015). LC is generally geared towards improving the productivity of the construction industry in addition to improving capacity of the industry's practitioners to apply their knowledge (Ballard and Howell, 1998, 2003; Azziz and Hafez, 2013; Issa, 2013).

According to Biton and Howell (2013) the discussions on LC have been on-going for the last two decades mostly in the western countries, however, they argued that it has been largely been theoretical and recommended that researchers advance these discussions by exploring and refining the subject of LC. Pursuing this argument would certainly ensure that, processes and framework for regional peculiarities would be formulated to ensure applicable sustainable strategies are adopted.

This then suggest that the application of LC approaches and techniques can be a subject of continuous development training for practitioners within environmental professions in order to build their understanding, knowledge and capacity to apply the approaches and techniques of LC in the built environment processes and professional practices. Thus, promoting environmental sustainability through the applications of LC in the production of infrastructures within the built environment.

### **Conclusion and recommendation**

The continuous increasing concern for environmental sustainability has been rested on the ability of the practices within the built environment to act sustainably. Lean Construction has been identified as tools to be used to advance environmental sustainability by the built environment professions. The potentials of LC has been noted to include; value added construction deliverables, reduced construction waste and the promotion of sustainable environmental practices. Regional frameworks formulation has also been suggested in order to address specific peculiarities and applications.

Despite this theoretical discourse contributions to knowledge, it limitations is noted in the generalization of the Sub-Saharan countries as the reference for the developing economies. Consequently, the study recommends future studies to examine specific context with other methodologies.

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