EXPLORING THE RELATIONSHIP BETWEEN CONSTRUCTION PHASES AND SUSTAINABLE CONSTRUCTION PRINCIPLES

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Background

- The construction industry has been criticised for those of its activities that conflict with SD principles (Pearce, 2005).
- Construction consumes 50% of natural resources (European Commission, 2001).
- There is need for resource efficiency and alternative construction approaches
- Sustainable construction (SC) is seen as the industry's approach to achieve sustainable development (SD) (Abidin, 2010, Hoffman and Henn, 2008).

- Construction phases are generally viewed as sequential, they may alternate sequences as possible
- Common phases are: conception, planning, design, tender, construction and operation (Ahadzie et al., 2006, Lim and Mohamed, 1999, Takim et al., 2003)
- Construction professionals' decisions are important in achieving SC
  - *Their understanding and interpretation of these principles may be an hindrance*

- Professionals have treated SC principles in isolation (Kibert, 1994)
  - *compromises understandings of their interconnectivity*

- Few studies address the links between sustainable principles and their application during construction processes.

Sustainable Development

SD

Sustainability

Construction

Construction Phases

S

C

- Most definition of SD emphasises the importance of striking a balance between environmental conservation, social equity and economic profitability.

- Sustainability is the action taken to strike a balance between social, economic and environmental factors in achieving present and future demands (Ogunmakinde et al., 2016)

SD

Sustainability

Construction

Construction Phases

S

C

- Four levels of construction (Irurah, 2001)
  - Site activity
  - Comprehensive project cycle
  - Business of construction
  - Human settlement creation
- Construction phases are similar but depend on:
  - Size
  - Scope

SD

Sustainability

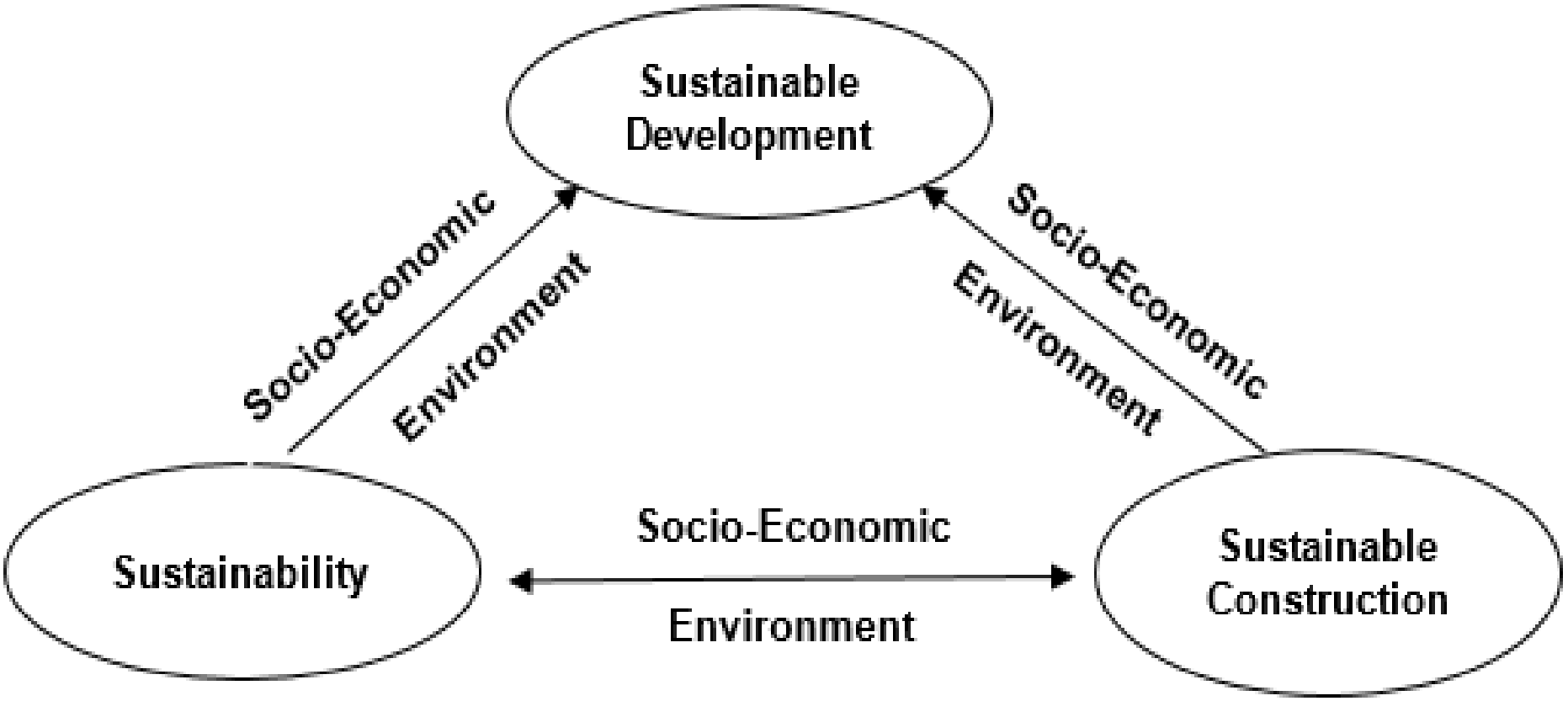
Construction

Construction Phases

SC

- SC is generally used to describe pre-construction, construction, and post construction processes.
- SC remains one of the ways industry meets present needs without compromises.
- Resource efficiency, construction activities and construction phases are critical to SD.

- Relationship between SC, SD and Sustainability

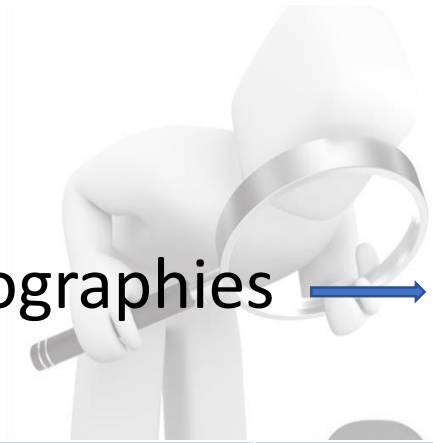


Sustainable Construction Principles

- Seven simplified principles of SC (Kibert, 2012: 8)
  - Reduce resource consumption
  - Reuse resources
  - Use recyclables resources
  - Protect nature
  - Eliminate toxics
  - Apply life-cycle costing
  - Focus on quality
- These principles inform stakeholders' decisions at each phase of design and construction (Kibert, 2012)

Methodology

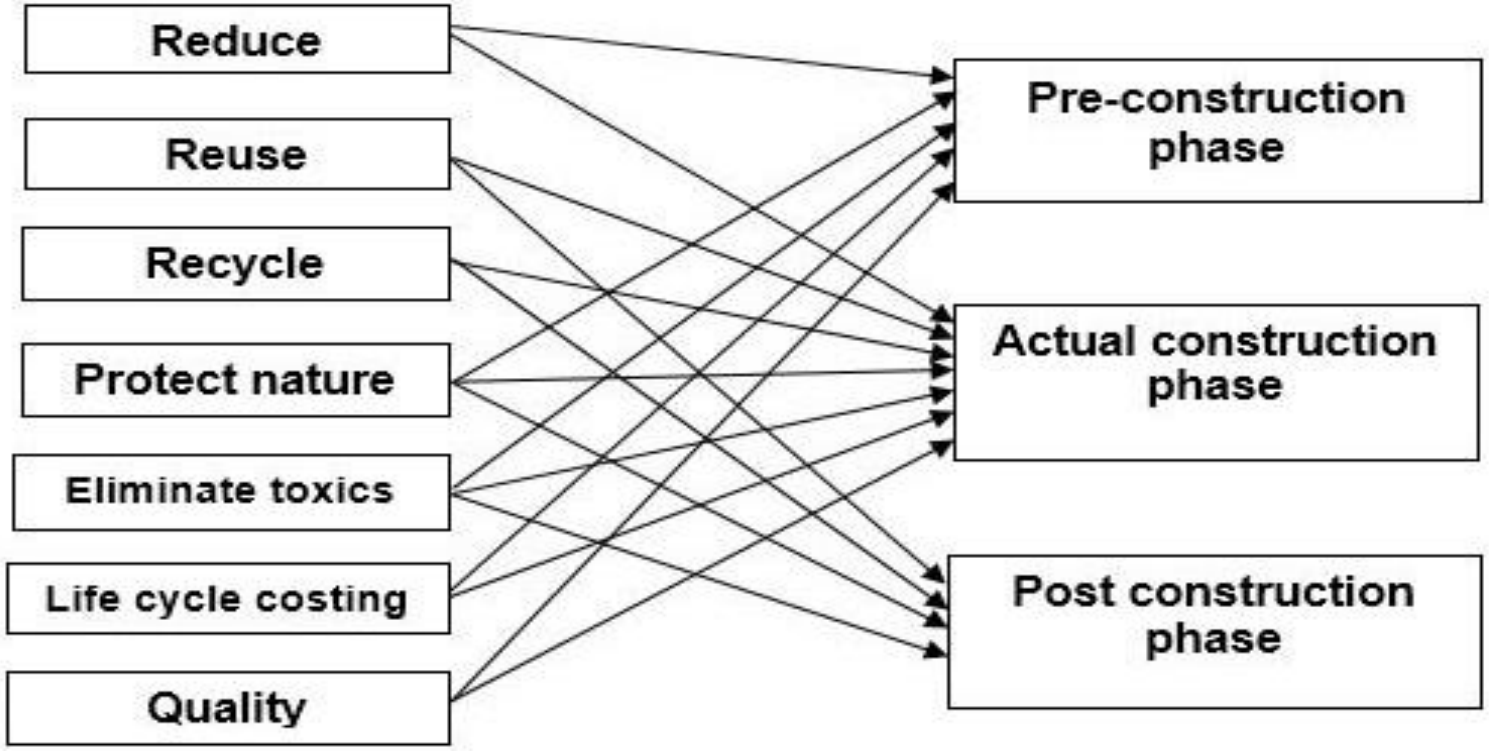
Abstract → Full text → Bibliographies → Additional journals



Keywords	Database	Publications
• Construction phases • Sustainable construction • Green construction technology • Sustainable development • Sustainable construction principle	Google Scholar Scopus Elsevier Science direct Sage	Journal articles Conference papers Theses

Findings

Framework for the relationship between SC principles and construction



SC Principles	Construction Phases

• **Reduce:** aimed at decreasing resource and energy input in the consumption and production processes (Yong, 2007, Su et al., 2013)
  • material reduction,
  • use of fewer resources
  • minimising the input of primary energy
	• Pre construction
	• Actual construction

• **Reuse:** It is where components used before are used again for the same purpose they were initially used for (European Union, 2008) • It has considerable environmental benefits including reduced energy consumption, fewer resources and less labour (Castellani et al., 2015, James, 2011)	• Actual construction • Post construction

SC Principles	Construction Phases

• **Recycle:** It is a recovery operation (Ghisellini et al., 2016) applied to products that can not be recovered or reused.
  • Fundamental & mandatory to achieving sustainability (Murray et al. (2015; Van den Berg and Bakker, 2015)
  • Reduces the consumption of virgin materials (Shi et al., 2006, Su et al., 2013)
  • Reduces waste from usable and potential materials (Birat, 2015; Lazarevic et al., 2012)
	• Actual construction
	• Post construction

• **Protect Nature:** It is associated with protecting and preserving the natural environment and its ecological systems	• Pre construction • Actual construction • Post construction

SC Principles	Construction Phases
• **Eliminate toxics:** use of non-toxic materials is as important as sustainable resource consumption is to SC (Pacheco-Torgal and Jalali, 2011) • Air and water pollution in buildings results from materials releasing toxic fumes and contaminating water (Pacheco-Torgal and Jalali, 2011, Liang and Ho, 2007)	• Pre construction • Actual construction • Post construction
• **Life Cycle Costing:** aimed at determining the overall cost associated with a project over time including acquisition, installation, operation, maintenance, refurbishment and disposal costs (Langdon, 2007, Fuller, 2010, International Standard Organisation, 2006)	• Pre construction • Actual construction

SC Principles

- **Quality:** It can be defined in terms of a building's aesthetic, functional and stability characteristics.
- Its purpose is to meet the requirements set by clients, design teams, constructors, and regulatory bodies (Arditi and Gunaydin, 1997)
- It must be ensured throughout a project including its visible and non-visible portions.
- good quality construction improves durability, economic viability, and resource efficiency whilst reducing maintenance.

Construction Phases

- Pre construction
- Actual construction

Conclusion

- The framework developed could improve professional's understanding and implementation of SC principles
- The relationship between SC principles and construction phases is mutually inclusive and critical in achieving SC.
- It is recommended that construction professionals first understand the context of sustainability, SC, SD and then familiarize themselves with the relationship between SC principles and construction phases.

Thank you

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