

Chapter 9

A Review of Sustainable Construction Practices in Ghana



Moses K. Ahiabu, Fidelis A. Emuze, and Dillip Kumar Das

9.1 Introduction

The importance of the construction industry to economic development cannot be underestimated. For instance, the construction industry contributes at least 7% to jobs and accounts for about 11% of the world's gross domestic product (GDP) (Roumeliotis & Fenton, 2011). Rapid urbanisation and industrialisation have necessitated an increase in the development of infrastructure projects. Such projects contribute to national economic development. The construction industry consumes a lot of natural resources that lead to climate change to meet the increased infrastructural demand of nations. The construction and maintenance of buildings account for about 40% of the world's natural resources and energy use (Edeoja & Edeoja, 2015, p. 112). The sector is generating unacceptable levels of material waste (Hussin et al., 2013), contributes a quarter of the global total carbon emissions and is responsible for 40–50% of the greenhouse gas emissions (GHG) (Huang et al., 2017).

The global movement against the effect of climate change on the environment has led many countries to focus on sustainable construction. Sustainable construction is believed to be the way for the built environment to contribute to the achievement of sustainable development (Abidin, 2010). The built environment in Ghana is responsible for land degradation, loss of habitat, air and water pollution and high

M. K. Ahiabu (✉)

Department of Civil Engineering, Central University of Technology, Free State, Bloemfontein, Republic of South Africa

F. A. Emuze

Department of Built Environment, Central University of Technology, Free State, Bloemfontein, Republic of South Africa

D. K. Das

School of Engineering, University of KwaZulu-Natal, Durban, Republic of South Africa

energy usage (Ofori, 2012; Djokoto et al., 2014). However, if the built environment adopts sustainable construction practices, it can help mitigate these negative impacts. The stakeholders in Ghanaian construction are aware of the destructive nature of conventional construction practices (Ayarkwa et al., 2017). The desire for sustainable construction practices has been on the increase among clients, sponsors, construction professionals, government agencies and regulatory bodies (Ogungbile & Oke, 2019). As a result of the benefits linked to sustainable construction, the built environment is increasingly incorporating sustainability practices into new buildings and existing buildings (Ahn et al., 2013).

Notwithstanding the benefits of sustainable construction, research has shown that implementation of sustainable construction in Ghana is at the infant stage. Unsustainable design and construction practices as well as constant degradation of the environment for construction purposes still exist (Ayarkwa et al., 2017). However, barriers such as perceived initial cost, lack of political commitment, lack of legislation, lack of professional knowledge and technological difficulties must be removed. There is a growing interest in analysing the extent to which the barriers hinder the implementation of sustainable construction (Ayarkwa et al., 2010). Due to the importance of sustainable construction, this research aims to examine the level of implementation of sustainable construction practices in Ghana to reduce the carbon and ecological footprint with emphasis on the barriers and drivers for a successful application.

9.2 Research Method

The study method adopts a conceptual approach to review related literature. A traditional literature review is a comprehensive, critical and objective analysis of the current knowledge on a topic (Baker, 2016). The traditional review identifies central issues and research gaps. According to Jesson et al. (2011), a traditional literature review is a written appraisal of what is already known with no prescribed methodology (cited in Li & Wang, 2018). It is a research method in its own right. It presents a summary of published research to a particular topic of interest in a way that contributes to a better understanding of issues (Jesson et al., 2011). The selection of materials was based on a purposive selection with significant contributions to context-specific knowledge taking precedence over citation metrics. The researcher logically put the publications together to develop a coherent argument on the subject matter. However, there may be essential contributions and knowledge transfer in both a systematic review and a traditional review (Jesson et al., 2011) to identify gaps or inconsistencies in a body of knowledge. The next section is therefore based on the review of the related corpus.

9.3 Literature Review

9.3.1 *The Construction Industry in Ghana*

The construction industry contributes to the socio-economic development of Ghana. According to Osei (2013), the construction industry of Ghana can be likened to the UK construction industry of 1983. The industry is responsible for the construction projects covering key stages including feasibility, design, construction, operation, decommissioning, demolition and disposal. It delivers infrastructure and construction projects, which is defined by Du Plessis et al. (2002) as a broad process or mechanism for the realisation of human settlements and the creation of infrastructure that supports development. Two ministries supervise such projects in Ghana. The Ministry of Roads and Highways (MRH) supervises the road infrastructure, which is the backbone of the transportation systems in the country. The built environment falls under the Ministry of Works and Housing (MWH), which is the Government of Ghana's central management agency responsible for formulating policies and programmes for the housing and work sub-sectors of the economy. The ministry is mandated in line with Sections 11 and 13 of the Civil Service Act, 1993 (PNDCL 327). It also relies on Executive Instrument (EI. 28, 2017), to initiate and formulate policies for the works and housing sector, as well as coordinate, monitor and evaluate the implementation of policies, plans and programmes for the sustainable management of public land properties, drainage and coastal protection work and operational hydrology as well as safe, secure, decent and affordable housing using technical expertise and innovative methods for all people living in the country (Ministry of Works and Housing, 2017).

The agencies and departments responsible for the built environment include Public Works Department (PWD), Hydrological Services Department (HSD), Engineering Council (EC), Architects and Engineering Services Limited (AESL), Rent Control Department (RCD), Department of Rural Housing (DRH), Public Servants Housing Loan Scheme Board (PSHLSB), Architect Registration Council (ARC), State Housing Company (SHC) and Tema Development Company Limited (TDC). Akinradewo et al. (2019) categorised the industry's stakeholders into four main groupings as users and consumers, demand-side operators, regulators and supply-side operators. The construction activities in the built environment include the extraction and beneficiation of raw materials, the manufacturing of construction materials and components, the construction project cycle from feasibility to deconstruction and the management and operation of the built environment. Despite its significance to the overall national economic development, the built environment is arguably one of the most resource-intensive industries and considered as a significant contributor to environmental pollution (Zimmermann et al., 2005).

9.3.2 Description of Sustainable Construction

Kibert proposed the first definition of sustainable construction which appeared in Tampa (1994) as the creation and responsible management of a healthy built environment based on resource-efficient and ecological principles (cited in Bourdeau, 1999). According to Huovila (1998), sustainable construction aims at minimising the use of energy and emissions that are harmful to the environment and health. Lanting (1998) also conclude that sustainable construction is a process of the building which aims at reducing the adverse health and environmental impact caused by the construction process. Sustainable construction according to the International Council for Research and Innovation in Building and Construction (CIB) is the sustainable production, use, maintenance, demolition and reuse of buildings and construction and their components (CIB, 2004). However, Du Plessis et al. (2002) take sustainable construction further by introducing the idea of restoring the environment as well as highlight the social and economic aspect of sustainability. She defined sustainable construction as a complete process aiming at restoring and maintaining harmony between the natural and the built environments to create settlements that affirm human dignity and encourage economic equity.

In essence, sustainable construction is the application of sustainability principles to the construction life cycle from planning, constructing, mining raw materials to produce construction materials, using low embedded-energy materials, saving water and energy, deconstruction and managing waste (Mustafa & Bakis, 2015). The concept of sustainable construction is hinged on three main pillars, namely, environmental protection (1), social well-being (2) and economic prosperity (3) (Abidin, 2010). Striking the right balance between these factors is what is required to support true sustainability. For constructions to be sustainable, firms should, therefore, have an all-inclusive approach to the projects to achieve balance and consistent synergy among the three tripods of sustainable development (environment, economy and society).

9.3.3 Implementation of Sustainable Construction

There is a need for a sustainable development plan and strategy that should not be confused with the development plan of nations. A sustainability development strategy that creates jobs at the expense of the environment and social impacts and displaces thousands of people and reduces biodiversity defeats its purpose (Du Plessis, 2007). Sustainability lies in the relationship between social, economic and environmental issues. The main challenge for the construction sector lies in finding an approach to the physical, economic and human development to meet the requirement of sustainable development and construction defined by locally identified needs and value system. Du Plessis (2007) identified two main paths for the implementation of sustainable construction as the creation of capable and viable local

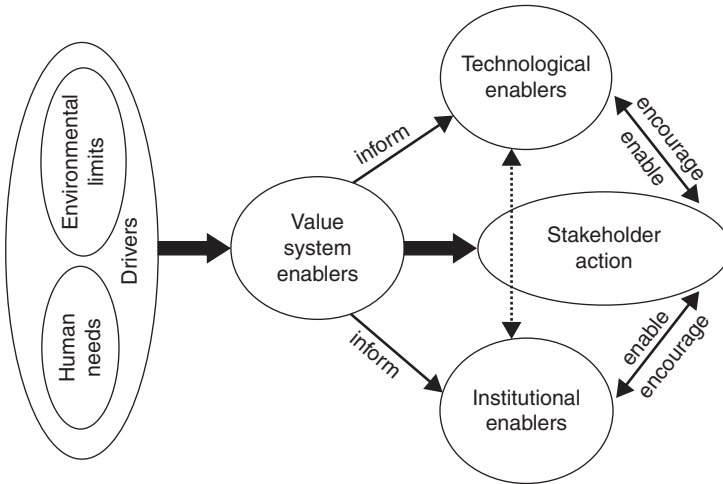


Fig. 9.1 A strategy for enabling sustainable construction (Source: Du Plessis, 2007, p. 72)

construction sector and the ability of the sector to respond to the demands that sustainable development and construction places on its activities. Adjarko et al. (2016) say that the minimisation of resource consumption, improvement of indoor air quality, avoidance of environmental health problems, use of recycled materials, waste reduction and maximisation of reuse are the critical sustainable construction principles applicable to Ghanaian construction. Sustainability can be achieved through strategic sustainable construction enablers. The enablers include technological, institutional and enablers related to a valued system such as social, spiritual or moral values that guide decisions as indicated in Fig. 9.1.

9.3.4 *Barriers and Drivers of Sustainable Construction in Ghana*

Barriers (please see Table 9.1) refer to attributes and conditions that can prevent and hinder actions or impede progress towards achieving sustainable construction practices (Vandierendonck et al., 2010; Ayarkwa et al., 2017). Barriers have adverse effects on the attainment of sustainable construction. According to Connell (2010), knowledge, awareness and attitude are internal barriers, while the external barriers include the availability of technology, finance and green technology. According to Ayarkwa et al. (2017), the financial incentive is identified as the main barrier to the implementation of sustainable construction in Ghana.

In contrast to barriers, drivers of sustainable construction are various elements that trigger, sustain and expand the uptake and implementation of required practices (Ayarkwa et al., 2017). Some drivers promote the implementation of sustainable

Table 9.1 Barriers to sustainable construction

Barriers	Research approach	Sample	Reference
Lack of financial incentives (high taxes and low-profit margin) Lack of building code and regulation Lack of investment Initial cost (high initial cost) Lack of client demand High cost of environmental services and technology Insufficient research Lack of public awareness Competitive pressure Lack of database and information Lack of green products Lack of professional knowledge and expertise Lack of green technology Tendering and contract requirements High level of perceived risks	Quantitative	Architects in Ghana	Ayarkwa et al. (2017)
Cost considerations and implications Lack of sustainable practices knowledge Attitude of professionals Absence of a sustainability rating tool Total cost of alternative energy sources Total client control on the design	Quantitative	Finland	Bash and Hakkinen (2015)
Lack of building codes and regulations Lack of incentives Higher investment cost Investment risks Higher final cost Lack of public awareness Lack of demand Lack of strategy for promotion Lack of expertise Lack of cooperation Lack of database and information Resistance to change Lack of training Lack of technology Lack of government support Lack of a measurement tool	Quantitative	Construction professionals in Ghana	Djokoto et al. (2014)

(continued)

Table 9.1 (continued)

Barriers	Research approach	Sample	Reference
Lack of building codes and regulations Lack of incentives Higher investment cost Investment risks Higher final cost Unavailability of design and construction team Lack of technology Lack of training Lack of cooperation	Mixed methods	Contractors and consultants in the UK	Opoku and Ahmed (2014)
Increased capital cost contract requirements Large size and diverse company activities Perception that sustainability costs more Managing competing and conflicting targets with other business aims Sustainability is down on the boards' priority list	Quantitative	Architects in Ghana	Bangdome-Dery and Kootin-Sanwu (2013)

construction practices. Revel et al. (2010) categorised the potential benefit to be accrued in terms of jobs, right corporate image and retention of quality staff as pull factors. Push factors are reactions to regulatory demands and financial incentives. Change in legislation, building codes and bylaws are essential moderators that could trigger, promote and sustain sustainable construction (Ayarkwa et al., 2017). According to Ayarkwa et al. (2017), actions such as a change in legislation, building code and bylaws, tax rebates/subsidies on green products and availability of integrated technology can promote and enhance sustainable construction in Ghana (Table 9.2).

9.4 Lessons Learnt

The construction industry in Ghana contributes to the socio-economic development of the country. It is patterned on the UK model. The ministry of works and housing is the agency responsible for construction works in Ghana. Despite the reported challenges, construction professionals are aware of the benefits of sustainable construction in Ghana. However, the implementation of sustainable construction is at

Table 9.2 Drivers of sustainable construction

Drivers	Research approach	Sample	Reference
Client demand and requirements Stakeholder influence Cost efficiency Competitive advantage Legislation and regulations Awareness and knowledge by top management Clear and consistent guidelines for measuring sustainable construction Win more contracts to remain in business Financial incentives (tax rebates, high-profit margin) Company’s reputation and brand image to attract and retain the right staff Availability of life cycle cost analysis Moral obligation to protect the environment Investment	Quantitative	Architects in Ghana	Ayarkwa et al. (2017)
Regulations Costs, risks and market value Demand and the role of clients Tendering and procurement processes Process phases and scheduling of tasks Cooperation and networking Knowledge and common terminology Availability of integrated methods Innovation	Quantitative	Construction professionals in Finland	Bash and Hakkinen, (2015)
Demand by stakeholders Financial benefits Need for corporate/social responsibility Environmental sustainability	Qualitative	South African construction professionals	Windapo (2014)
Financial incentives Building regulations Client awareness Client demand Planning policy Taxes/levies Labelling/measurement Investment		Construction professionals in the UK	Pitt et al. (2009)

(continued)

Table 9.2 (continued)

Drivers	Research approach	Sample	Reference
The imposition of stricter regulations Establishment of the longer customer-supplier relationship Awareness of the environmental, social and economic impact Implementation of an environmental management system Push from the top management Implementation of ISO14,000 kind of certifications	Quantitative	Construction professionals in India	Arif et al. (2009)

the infant stage, where the accrual of benefits is minimal. The construction industry, and by implication the built environment, is a significant contributor to global climate change and other environmental threats. It consumes three billion tons of global raw materials annually and produces an enormous amount of waste. Climate change may continue to be a global threat for generations to come if practical actions are not expedited in the built environment. The sector needs to take practical action to mitigate the impact of various threats. The research on the carbon and ecological footprint is of particular significance in dealing with climate change to restore the ecological balance.

Sustainable construction practices are not frequently used in Ghana. The main barriers to the implementation of sustainable construction include lack of financial incentives, lack of demand, lack of governmental commitment, lack of legislation and lack of building codes and regulations to promote sustainable construction. The client demand and requirements appear to be the main drivers of sustainable construction in Ghana. However, there is no distinctive difference between barriers, drivers and enablers of sustainable construction because various researchers use the terms interchangeably. There is a need for further research to define these terms. This will help increase the awareness level for implementing sustainability.

9.5 Conclusion and Way Forward

The construction industry in Ghana has significantly improved, and there is a growing awareness for adopting sustainability practices in the sector. However, the literature on sustainable construction in Ghana is minimal. As such, this study contributes to the literature on sustainable construction in general and Ghana in particular on the current state of implementing sustainable construction practices in Ghana. It is concluded that sustainable construction practices are marginal in Ghana (Ahiabu

et al., 2019), although the industry is a significant consumer of natural resources that contribute to climate change. In effect, there should be an increased level of awareness of the benefits of sustainability to ensure that more projects adopt sustainable construction measures to reduce carbon and ecological footprint, which can reportedly combat climate change (Garcia-Olivares, 2015). The government of Ghana should introduce financial incentives to construction companies and professionals in the built environment that adopt sustainability to lower the negative environmental impact of construction activities. The following actions could be taken to reduce the effects of construction activities on the environment:

- Minimisation of resources consumption.
- Improvement of indoor air quality.
- Avoidance of environmental health problems.
- Use of recycled materials.
- Waste reduction and maximisation of reuse.
- Increased sustainability literacy and education.

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