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Towards enabling construction organizations' adaptation to environmental sustainable construction in developing countries

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Abstract

Giant strides have been taken in developed countries towards the achievement of sustainable development goals. This has been pursued largely through the establishment of relevant policies and regulations and that significantly require the construction industry's role. Environmental sustainability is foundational as far as the pursuit of sustainable development is concerned. However, in developing countries, construction organizations are yet to be enabled to adapt to Environmental Sustainable Construction. How can these organizations be enabled to adapt to ESC? The aim of this paper is to find out enablers of construction organizations' adaptation to ESC in developing countries. A review of literature on the enablers of sustainability within the construction industry has be conducted and the need to identify enablers within the context of developing countries have been revealed. A content analysis of qualitative data obtained from an averagely 1½ hour in-depth interview of 13 construction organizations has been used to develop a relational model outlining primary elements required to enable commencement of regularization of ESC practices. On this basis, a conceptual framework explaining different time zones required for regularizing ESC, has been developed. Thus, a clear direction towards the development of a broader framework towards construction organizations' adaptation to ESC in a developing country context has been provided.

Keywords: adaptation, enablers, construction organizations, environmental sustainable construction, developing countries

INTRODUCTION

Since the release of the Brundtland report of the World Commission on Environmental Development (WCED) [1] sustainability has become a paramount issue and a significant drive for competitiveness among economies and in the corporate world. The report puts emphasis on the three traditional pillars of sustainable development (SD): Environmental, Economic and Social. Environmental sustainability is found to be foundational to overall achievement of the goals of SD [2, 3). Although the seventh of the eight Millennium Development Goals (MDGs) strongly challenges all economies, to achieve environmental sustainability, the achievement of the MGDs by the target year of 2015, is now clearly a mirage [4].

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As aftermath developments of the 1987 commission, various sustainable development summits such as: the 1992 summit in Rio de Janeiro, in Brazil; the 1995 social development summit in Copenhagen, Denmark, with review in 2000 in Geneva, Switzerland; and the Sustainable Development summit 2002 in Johannesburg, South Africa, have been held to drive home the SD agenda. During all these summits, environmental sustainability remained paramount. The construction industry in developing countries needs to give primary attention to environmental sustainability in their construction activities.

The 1992 summit resulted in the Agenda 21 for Sustainable Construction in Developing Countries (A21-SCDC). Among the contents of the A21-SCDC is a framework that proposes how sustainable construction can be adopted and implemented in developing countries. However, sustainable construction has still not been established in developing countries [5]. It is reported that in Ghana, a developing country, unsustainable development practices continue to cause irreparable damage resulting in deforestation, land degradation, air and water pollution, soil erosion, overgrazing, and destruction of biodiversity, [6] as well as energy wastage [7].

More than a decade after Bon and Hutchinson [8], Ofori [9] and Hill and Bowen [10] had indicated that economic, framework and resource inequalities between developed and less-developed countries pose challenges to the establishment of sustainable construction concept, other recent studies still confirm this menace of construction industry stakeholders inability to establish sustainable construction in developing countries [11, 12, 5]. Less-built capacity, inadequate resources, knowledge, systemic and framework gaps have been cited as major challenges contributing to low or lack of performance in sustainable construction in developing countries. These challenges are sources of concern that require more efforts from researchers, industry practitioners and governments to find practical and effective ways of enabling stakeholders to implement environmental sustainable construction practices.

Within the construction industry, construction organizations remain major front liners [13]. Hence, their ability to adopt and practice sustainability in their daily construction activities is paramount to the achievement of global sustainable development. The objective of this paper is to therefore identify the enablers of ESC in construction organizations in the context of developing countries.

Environmental Sustainability in the Construction Industry

The emerging direction of research activities into sustainable development indicates that sustainability is timely and an important area driven by global concerns. Climate change, depletion of fossil energy resources and the alarming trends of carbon foot prints are some of the developments that must be given urgent attention not only by emerging economies but also the developing world. However, achieving consensus requires the various parties, especially the construction organizations, which are the implementers of construction projects, and have direct relationship with biodiversity, to be knowledgeable and well equipped to meet the demands of sustainable development.

Bouchlaghem [14] indicates that the built environment is widely recognized as a major consumer of energy and contributor to the overall CO2 emissions into the atmosphere. The role of the built environment industry is therefore highly necessary for the achievement of environmental sustainable development goals globally.

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While there is a call for a holistic approach to implementation of sustainability principles, sustainability technology, knowledge and practices identified have not been effectively utilized [15]. Corbera et al. [16] and Robichaud and Anantatmula [17] also acknowledge that little research has been conducted on how, for instance, construction activities can be done without causing rise in greenhouse gases (GHG) emissions, especially carbon, which is the most common. Moreover, there is/are lack of framework(s) to guide practices that would ensure achieving sustainability in developing countries [41]. Hence, it is highly necessary to explore ways of establishing sustainable development practices by stakeholders in the construction industry in the context of a developing country.

The global nature of environmental sustainability challenges

To overcome the challenges associated with environmental sustainability within the corporate domain, globalisation has an important role to play [18]. Porritt [19], Capra [20] and Shrivastava [21] argue that by the very nature of certain problems such as global warming and the melting polar ice caps, which are environmentally threatening, a strategy with global dimension would be required to deal with the associated global effects. This implies that the actions conducted in one part of the world affect the physical conditions felt by the occupants of another.

Factors relating to a holistic approach, which are acknowledged as: 'organizational learning disability' [22] and 'failure of organizations to understand their holistic role' [23], are essential in dealing with the problems of environmental sustainability in developed, emerging and developing economies. Borland [2: p. 13] argues that "while the market economy (in developed and some emerging economies) is improving its physical environment in terms of reduced pollution and reduced natural resource usage, much of the most polluting activities, such as commodity processing and heavy manufacturing, are being relocated to the emerging market economies." Therefore, given the much larger population base in these developing countries, their rapid industrialization could easily offset the environmental gains made by developed economies.

Construction organizations in developing countries are also susceptible to the influx of some of these environmental polluting activities. Thomas [23] recognized the laxity of the corporate world in dealing with the problems that confront environmental sustainability and indicated that pursuit of the financial bottom line and a focus on shareholder value by many organizations have led them to ignore the wider implications of the role of the corporate entity in society and the environment. It will therefore be counter-productive if construction organizations ignore their responsibility to uphold and pursue the global efforts required to deal with environmental sustainability challenges as advocated by the industry in developed economies. A collaboration between construction organizations in these economies is obviously needed to enable the execution of local construction works without compromising on the principles of environmental sustainability. The resulting improvement could be the institution of relevant organizational policies and initiatives that will guide regularized execution of ESC practices.

It is, however, worthy to note that, in employing a holistic approach to deal with environmental sustainability challenges, regional peculiarities should not be ignored. Overlooking features that are peculiar to a given region could result in development of inappropriate solutions. For instance, Amekudzie et al. [24] advocate that carbon management is highly necessary for achieving sustainable development in any country. But this can be effectively achieved by taking comprehensive approach; exploring different standards and targets for different

typologies of countries based on their present levels of development. The authors asserted that this may be helpful in developing the consensus needed for global standards for effective carbon management. Du Plessis [25] also buttresses this by drawing attention to the fact that due to differences in developmental agenda of developed and developing countries, special knowledge and skills are required to establish a sustainable development plan in developing countries.

Capability of local construction industry to initiate ESC regularization

It has been argued that to enable sustainable construction in the local construction industry, "…it is first necessary to create a capable and viable local construction sector; second, it is necessary to ensure that the sector is able to respond to the demands sustainable development places on its activities" (Du Plessis, 2007:71). Contractors therefore need to build their ability in order to respond to the demands of sustainable development. However, the construction industry's viability and ability to practice sustainable construction would need to be first hinged on an enabling atmosphere. In Ghana, a developing country, large construction works are undertaken by foreign firms rather than the indigenous ones, duties of capacity challenges that face indigenous construction firms [26]. To ensure that sustainable construction targets are set and achieved in developing countries, indigenous firms need to build up skills, knowledge and innovation that will enable the application of sustainability practices at all stages of construction works.

Sustainable construction is a major medium for achieving environmentally friendly construction, low carbon economy and the goals of sustainable development. Therefore, the construction industry would need to play a pivotal role in ensuring that construction activities are executed without compromising on sustainability principles. This pivotal role creates the opportunity, and also the obligation, for construction organizations to take up the leadership position [27]. Such a position is critical to the minimization of destruction of the ecosystem due to construction activities.

Taking up this leadership role will require going beyond the execution of the routine construction work, to act as advocates in preparing the broader public sector, business and public opinions for the huge task of realizing sustainable construction. The construction industry should be able to set an example in its own practices. Overall, though, the task will require new thinking, new ways of doing familiar things, and the acquisition of skills. Involvement of construction organizations and other relevant bodies in this task would create the opportunity for securing a competitive advantage both locally and internationally [28].

Since governmental initiatives are not adequate to solve the environmental problems we face, the need for the construction industry to take up the leadership in ensuring that environmental sustainable construction practices are adopted in order to reduce negative effects, such as global warming on the ecology, is becoming increasingly important. This important role of construction business organizations is buttressed by the statement given in the Green House Gases (GHG) protocol reporting standard of the World Resources Institute and World Business Council for Sustainable Development, WRI/WBCSD [29 p. 3], that:

> *"Emissions of the anthropogenic greenhouse gases (GHG) that drive climate change and its impacts around the world are growing. According to climate scientists, global carbon dioxide emissions must be cut by as much as 85 percent below 2000 levels by 2050 to limit global mean temperature increase to 2 degrees Celsius above pre-*

> *industrial levels. Temperature rise above this level will produce increasingly unpredictable and dangerous impacts for people and ecosystems. As a result, the need to accelerate efforts to reduce anthropogenic GHG emissions is increasingly urgent. Existing government policies will not sufficiently solve the problem. Leadership and innovation from business is vital to making progress."*

Construction industry's environmental regulations and policies

The environmental management capacity of an organization is highly necessary for its efficient performance. Attention needs to be given to the ability of construction contractors to adopt and implement environmental sustainability practices that will foster promotion and achievement of construction sustainability industry-wide. To be able to establish an environmental management system within a construction business organization, it is important to have enablers that will provide an encouraging atmosphere for adoption and implementation of any environmental management strategy.

Environmental sustainability is the prime concern in the pursuit of sustainable development. It seeks to sustain global life-support systems indefinitely. This principally refers to those systems that maintain human life. Protection of the environment must be a responsibility of all sectors of an economy. The construction industry is widely known as one of the largest sectors whose activities have significant effect on the environment [28, 30, 31]. Therefore, organizations within the construction industry have role to play in ensuring environmental sustainability.

In a study into the drivers of contractors' green innovation, Qi et al. [32] found out that for a contractor to be able to adopt green practices in its organization, factors such as managerial concern, environmental regulations and size of firm are important drivers. The research findings were obtained in the Chinese context and there is need to also find out, in a developing country context in Africa, the factors that would enable and drive contractors' adoption and implementation of ESC practices. Also, whether some of these drivers identified by Qi et al. [32] are present in a developing country context, such as Ghana, is something that needs to be investigated.

Construction organization's ability to adopt sustainability practices comes with some advantages. Chief among such benefits is the organization's competitiveness. Tan et al. [28] asserts that a contractor's ability to implement sustainable construction practices contributes to the improvement of its competitive performance. He further developed a model to show that there exists a relationship between the sustainability performance and business competitiveness of a contractor and determined that the relationship is positive.

Also, adherence to environmental regulations had been considered by Porter and Van der Linde [33] as a driver of innovation and efficiency in resource use in any business organization. Tan et al. [28] and Testa et al. [30] have argued for the fact that environmental regulation is one of the important drivers of contractors' environmental and competitive performance. Environmental regulations are normally instituted to ensure that organizations whose activities affect the environment take measures to eradicate or minimize the negative effects of their action on the environment. These also sometimes impose penalties on defaulting organizations; penalties meant to serve as 'compensation' to the social-ecological system affected by unsustainable practices. The construction industry stands as one of the major sectors whose activities result in a lot of depletion of natural resources, and by nature, have significant negative effect on the environment especially in terms of carbon emissions. In view

of this, governments in some countries have instituted regulations to ensure that construction activities are environmentally-friendly [34].
Construction contractors are regarded to be at the forefront of construction activities and therefore hold much responsibility in taking steps towards complying with such environmental policies. Other operational features of environmental regulations such as: penalty like cost/charges for carbon emissions; rewards like tax rebate and loan schemes for carbon reduction efforts; more severe ratings/standards; and receiving education and training from governments and professional associations, have also enhanced efforts to promote environmental sustainability (35, 36, 37, 38, 39)

However, Testa et al. [30] found out that the building and construction sector is considered to be under the threat of losing its competitiveness due to compliance with extensive energy and environmental regulations. This could be among the reasons for the findings that emanated from the study of Wong et al. [13]. The contractors who were involved in the study to find out how contractors respond to CO2 reduction policies in the sector might not adjust their attitudes in carbon reduction strategy adoption for the sake of avoiding 'penalty' given in regulations. The authors admitted that this finding is thought provoking and more research needs to be done into the behavioural drift of contractors towards adoption of environmental protection strategies.

The implication is that in spite of the existence of these regulations, regarded as sustainability drivers, further research needs to be carried out among construction organizations in developing countries. The ability of such policies to foster environmental sustainable construction practices can be ascertained through such further studies. In a developing country, such as Ghana, the compliance with sustainability practices and principles is more relaxed among construction industry practitioners [40]. Therefore, there is the need to find out the enablers and drivers of construction organization's ESC.

Barriers/Challenges to the practicing of ESC
Having organization's ESC policies in place, apart from governmental environmental regulations, could be an enabler of sustainable construction practice. However, Du Plessis's [41] revelation about the situation where sustainable construction in developing countries is yet be established, seems to suggest that contractors may not have their own organizational policies on how to ensure environmental sustainable construction practices. There could be the presence of both internal and external organizational challenges requiring investigation. Such challenges may have the tendency to affect the ability of construction organizations to adapt to ESC.

For instance, as advocated by, Global Reporting Initiatives (GRI) [42], construction organizations should be able to report on their sustainability performances in order to enhance their chances of complying with relevant environmental regulations. What needs to be ascertained is whether construction organizations in a developing country have the ability to assess their sustainability performance to serve as a basis for reporting on such performances. What has not been assessed cannot be reported on properly. Zhou et al. [43] emphasizes the growing need for sustainability in construction to be adequately measured. For sustainability assessment to be carried out effectively and economically in an organization, it would be required to have the relevant staff that wields the needed knowledge and skills in sustainable construction. However, such personnel are lacking in many business organizations in some developing countries [44].

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Other barriers that could hinder organizations' from reporting on sustainability performance using the GRI standard exist. Some of these have been highlighted by Fonseca [45] as: lack of capacity-building at sites; lack of interest from local stakeholders; unclear cost-benefits; increased information management task and excessive corporate exposure.

Besides the need to overcome some of the barriers outlined above in order to report effectively on sustainability matters, construction organizations should have the ability to pursue specific efforts directed at achieving specific environmental sustainability goals. For instance, on the basis of inventory proposal by European Network of Construction Companies for Research and Development (ENCORD) [46], a specific goal such as reducing carbon emissions from construction activities would require planning well on how to reduce fuel usage and electricity consumption on a given project and, in general, daily business operations.

In Africa, where most of the developing countries exist, such sustainability strategies may not be well established. The ability of contractors to network with other sister construction organizations both locally and internationally and use such platforms for benchmarking and enabling sustainable construction practices seems to be useful in supporting a holistic establishment of sustainable construction in developing countries. However, should there be the existence of some barriers against the international and local networking efforts of construction organizations, these should be investigated and minimized to facilitate establishment of ESC in developing countries.

There are environmental policies that have been put forward by bodies such as the United Nations Environment Programme, UNEP [38]. Some of these include: introduction of carbon trade off mechanism; maximizing carbon reduction in the renovation of buildings; reduction technologies demonstration on buildings and advertising places to increase awareness amongst public; movement to holistic application of sustainable buildings solutions systematically; and working with the government to develop policies that would make a difference in the negative effects of construction organizations' activities on the environment. Adegbite et al. [44] also indicated that private stakeholders' collaborative initiative with government is necessary for promoting sustainability nationally. Regularized adoption of these strategies by construction organizations in developing countries could foster effective environmental sustainable construction practices. This will require holistic development of the ability of construction industry players, after creation of an enabling atmosphere, to foster a holistic adaptation to a system of ESC practices.

Governmental collaboration and commitment

Creating an enabling atmosphere would demand close collaboration and support from governments, which may also be critical to the attainment of such a system that provides the wheels for sustainable construction. Therefore, the commitment of the government to achieving construction industry sustainability in its delivery of infrastructure should be a matter of interest to the objectives of this research. There seem to be non-existence of such government-private business collaborative efforts in the developing countries. This kind of collaborative effort is recommended by Adegbite et al. [44]. They found out that although businesses in Nigeria have started pursuing sustainable development programmes to improve their corporate social responsibility, there have not been efforts by the government to develop sustainable development policies towards the private organizations sustainability practices. Their study covered organizations in the oil and gas, telecommunication and banking industries. The capability of the construction sector to embark upon self-initiated sustainable

development programmes and also take the initiative to prompt governments to be engaged in collaborative efforts for the establishment and promotion of ESC practices is also crucial to the attainment of the overall objective of realizing the adaptability of construction organizations.

Adapting to sustainable practices and compliance amidst regulations would require the understanding and positive response of construction organizations towards making significant changes in traditional construction methods. This would require innovation and readiness to employ modern construction technologies and methods.

In the view of Wong et al. [13] construction organizations in Australia would rather be motivated to adapt to environmentally friendly practices on the pedestal of organizational policies. Institution of such policies could stem from the desire to increase marketability and competitiveness. It is possible for such a desire to also drive innovation among construction organizations in developing countries. However, Wei and Lin [47] and Yitmen [48] have also argued that the construction industry, compared to others, is backward and would fail to innovate in order to progress higher in technological advancement.

Qi et al. [32] brought in another dimension regarding what could drive contractors' green innovation. The authors found a strong correlation between government regulations and size of business, suggesting that the larger the size of a company the higher its ability to comply with regulations on environmentally-friendly practices. Within the context of developing countries, the drivers of construction organization's environmental sustainability practices need to be established as well as the features, which when possessed, would enhance the ability to adapt to ESC practices.

Green rating in Ghanaian construction industry

Policy making bodies such as government and relevant established institutions play significant role in the formulation and enforcement of environmental regulations. Most of the green rating systems exist in the developed countries [49]. Whilst green rating tools like the LEED by the US Green Building Council and the BREEAM by the British Research Establishment in UK have been established and have been in use for the past two decades, Ghana, a developing country, has now been able to establish the Ghana Green Building Council (GHGBC) in 2009.

The GHGBC is at its infantile stage and has not been able to establish regulations, in collaboration with the government, for enforcement among relevant stakeholders. It has the aim of developing a green rating tool for the property industry in Ghana. The purpose of this rating system is to: establish a common language; set a standard of measurement for green buildings; promote integrated, whole-building design; recognise environmental leadership; identify building life-cycle impacts; and raise awareness of green building benefits [50].

It seems stakeholders in the Ghanaian construction industry, such as construction organizations, are not aware of green building benefits associated with SD. In view of the efforts by the GHGBC to instill the principles of sustainable development in the local property/construction industry, there is the need for construction organizations, who are the implementers of professional plans and designs, to reposition themselves for adapting to green construction practices [29, 32]. This will facilitate establishment of an ESC system and promote sustainable development principles.

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Kibert [51] outlines the Pennsylvania Governor's Green Government Council (GGGC) and this defines the requirements for ensuring environmental sustainability or improved green practices of a building project. Awareness of some of these requirements by the construction industry in developing countries is necessary and this can be generated through international collaborations, knowledge creation and dissemination. It is important that the human resources within construction organizations in developing countries are well equipped with requisite knowledge and skills in order to overcome challenges associated with establishment of sustainable construction [52]. This would contribute to establishing effective ESC within a contractor's organization. Environmental regulations and standards used elsewhere may also be relevant to building the foundation for construction organization's policy set up. Nonetheless, within the context of developing country, there might be certain peculiarities that must be considered to create a relevant and effective ESC 'system' for effective adaptation to the sustainable construction concept.

RESEARCH METHODOLOGY

Qualitative approach, after extensive review of pertinent literature, was used to explore how ESC could be enabled among construction organizations. First, literature on construction organizations' twelve sustainability practices, in light of global trends of sustainable development, were reviewed. Secondly, a semi-structured interview of built environment professionals working with thirteen construction organizations in Ghana was carried out. Adopting a combination of the critical review of literature and semi-structured interview was found to be an effective strategy. Other works that probed sustainability issues, as a growing concept, using this approach successfully include: Al Surf et al. [53] and Opoku and Fortune [27]. Moreover, the approach is found to be appropriate due to the exploratory nature of the research problem [54].

The participating construction organizations have Ministry of Water resources Works and Housing (MWRWH) Classification D1/K1 . The organizations were purposively sampled such that only participants who bear the needed characteristics that meet the research objective were interviewed. The criteria set for the selection of the organizations, among others, included: having comparatively higher organizational and structural ability; being currently active construction organization operating with variety of on-site construction equipment; and having qualified built environments professionals. This was to enable effective achievement of the larger aim of the research, which is to find out how construction organizations would be able to adapt to environmental sustainable construction practices.

The semi-structured interview involved asking a number of predetermined open-ended questions [54]. Interviewees were questioned in a systematic and consistent order [55, 58]. Besides the predetermined questions, other questions were framed during the interview for the purpose of probing unclear responses. The semi-structured interviews allowed greater flexibility and permitted more valid responses from the participants resulting in clear revelation of their perception of the research subject [56]. Peripheral records of observations of site practices and office organization were kept for purposes of having in-depth discussion of transcribed interview data [57, 58).

The transcribed qualitative data were analysed using conventional content analysis [59, 60, 61]. The focus of the questions was on the ESC practices adopted by the construction organizations. In addition, questions on associated barriers, drivers and enablers of adaptation to ESC were also posed. These were meant to feed into future directions of the research.

FINDINGS AND DISCUSSIONS

Ad hoc performance of ESC activities

The interview and observations carried out among the organizations involved in this study revealed that some of the ESC activities are being carried out without necessarily pursing SD agenda. Interviewees had learnt about some of the ESC activities. However, few of these activities were being practiced. Moreover, the mode of practice was found to be ad hoc.

Observation of site practices revealed the use of signage to ensure compliance to health and safety requirements. The signage could not have been deemed as adequate in view of sparse placements at the construction site. The most common signage observed was the type that contained information on health and safety. Signage outlining how environmental sustainability should be ensured on site was not observed. Some of the interviewees were of the opinion that the Health and Safety portfolio created is adequate to deal with all environmental requirements of the construction. However others who were found to have little concern for Health and Safety issues were of the view that, for construction organizations to be enabled to carry out ESC practices comprehensively, there is the need to create an office for ensuring the organization's strict compliance to ESC practices.

It was found that some organizations perform ESC activities but not with the objective of pursuing sustainability. One of the interviewees remarked:

> *"We have made it our priority to ensure waste minimization on all our sites, so that we can reduce cost and also increase profit. We are not doing this because we want to practice ESC. In order to achieve this waste minimization and efficiency in our construction activities, we have instituted a reward system for the site that achieves the highest waste minimization" – R-07*

Involvement of Government

Respondent 07's (R-07) statement about site waste minimization initiative indicates the importance of an organization's commitment as a primary step for adaptation to ESC. This level of commitment was not the case across all the other organizations. Rather, a situation where organizations tend to rely on the assistance of government, which is the largest client, for instituting ESC measures, was portrayed. For a more regularized ESC practice, a legislative charter from the government was recognized as a fundamental enabler for the ESC. The participants emphasized the need for having a law from the government to regularize sustainability requirements in the construction industry.

The need for tax incentives to reduce the construction organizations financial commitment towards importation of sustainable technologies was also a point of emphasis. Interviewees acknowledged the relatively expensive nature of importing construction plant and other materials such as geo-panels, plastic materials and metal props for use of formworks. Introduction of tax incentives and import duty waivers by the government to motivate contractors to pursue sustainable technologies was realized as one of the governmental assistance to enable ESC.

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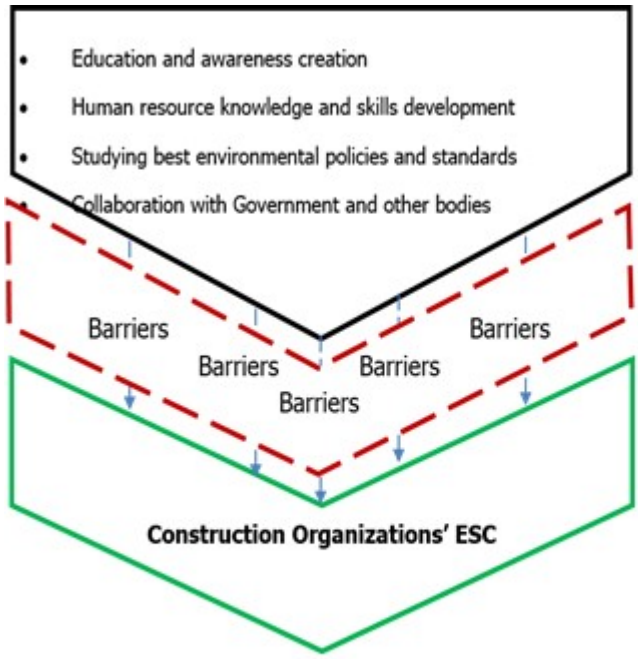

Fig. I – Relational model of construction organization's path to ESC

Primary elements of ESC in a construction organization

Qualitative data from the interview revealed some primary elements (as indicated in Fig. 1) that are necessary to create an enabling situation for ESC to happen in a construction organization in developing country. These elements include: education and awareness creation; human resource knowledge and skills development; studying best environmental policies and standards; and collaboration with government and other relevant bodies. Without the dynamics of education, awareness creation, building the required knowledge and developing skills, learning from best sustainable construction practices and collaborating with the government, creation of an enabling environment for the adaptation to ESC may be difficult, if not impossible.

Sustainable procurement requirements and short term profit as potential ESC drivers

It also emerged that including the capacity of a contractor to satisfy environmental sustainable requirements in the selection criteria during tendering could be used to check compliance with environmental regulations. Construction organizations are always inclined towards satisfying tendering and contractual requirements. In the light of this, the reformation of tendering requirements and contractual provisions to include sustainable development demands is necessary for ensuring adaptation to ESC. This could call for a second look at the existing procurement laws in developing countries to evaluate the presence and adequacy of sustainable construction provisions.

The desire to have a sustainable environment could drive the practices among construction organizations. However, the interview revealed that the overarching driver of construction organizations' ESC practices is short term business profit. This was expressed clearly in a participant's statement: "….having an environment that can sustain future construction activities is important but as an organization, our aim is to get profit and so if a work calls for a minimum destruction to the environment, but will bring us profit, we will carry it out"- R-11

Organizations supporting this opinion perceive that 'associated high initial cost' is a challenge to the practicing of sustainable construction in developing countries. This perception is comparable to the finding of Qi et al. [32] about the difficulty in adopting green building practices by developers in Malaysia. With this perception, it is not surprising to find out that short term profit would drive ESC among construction organizations rather than long term benefits associated with ESC.

CONCEPTUAL FRAMEWORK

Based on the relational model and findings from the interview, a conceptual framework of ESC enablers for a construction organization has been developed as shown in Fig 2. The concept behind the framework is adopted from DuPlessis (2007). The various kinds of enablers are therefore explained in subsequent passages. The framework is developed by taking into account organizational, national and international considerations that must be made by construction organizations in a developing country towards adaptation to ESC. These considerations are highly necessary since SC enablers are informed by local development needs as well as global environmental considerations [5]. Also, to have ESC well established, an approach requiring a construction organization to operate at different time scales: short, medium and long terms, is imperative.

Short term Enablers

Due to the lack of knowledge in sustainable construction issues among stakeholders and lack of understanding, especially by clients, it would be prudent for the knowledge base of stakeholders in developing countries such as Ghana, to be strengthened [62, Du Plessis, 2007). In the immediate term, this would require effective collaboration with global bodies that are well experienced and have adopted and practiced sustainable construction for more than a decade, in especially the developed countries. It is possible that this could increase the business operation cost of contractor organization, seeing that this is an initial additional cost associated with establishing sustainable development [27, 63].

There is a strong relationship between sustainability practice and contractor's business competitiveness [28]. This expected organizational competitiveness, due to establishment of sustainable construction principles, is likely to be a motivating factor for a construction organization's ESC practice. A framework indicating how government can collaborate by providing political and financial support to contractors who prove to be sustainability-oriented could also be a channel for overcoming this perceived huge initial cost challenge.

Medium term enablers

Overcoming some initial challenges in the creation of short term enablers, points to the need for some other medium term enablers. There is no perceived pressure from government, the largest client in the construction industry, and local communities, to drive sustainable construction agenda [32]. Therefore, it will be necessary for contractors to take the initiative using primary knowledge and skills acquired to collaborate with government and national green building council in promoting their understanding as well as advocating for their cooperation in the implementation of ESC [44].

Collaboration with national sustainability-related bodies such as GHGBC is an important step to be taken by building contractors. Contractors need to be aware of the role of such councils in the implementation and compliance with sustainable construction requirements. For instance, executing a building that is required to meet green rating standards would demand that a

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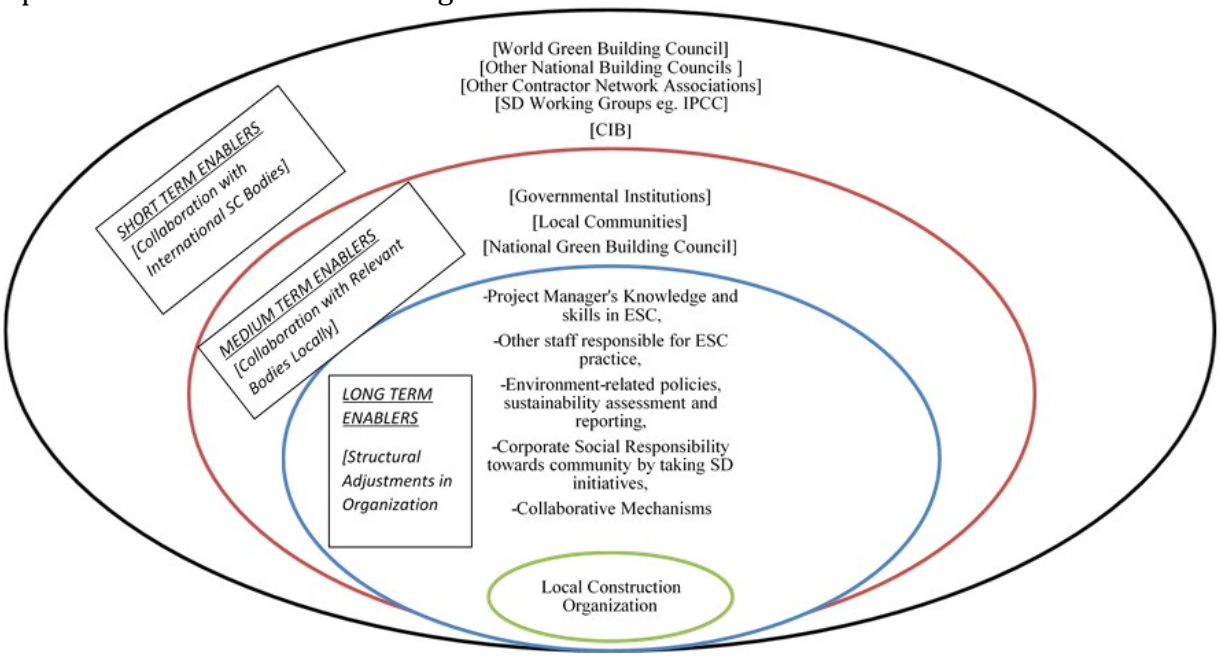
construction organization is knowledgeable in the constituents of green rating [50]. Teaming up with green building councils would create platform for organizations' education and awareness in green rating. This is also likely to increase the international business competitiveness of construction organizations.



LONG TERM ENABLERS

Managerial concern has been found to be the most important driver for the adoption of green practices in China [32]. Similarly, to have ESC established in the long term in a construction organization in the developing country's context, managerial decision would be crucial. Teriö and Kähkönen [64] recognized the criticality of management's decision in initiating changes in an organization. Adopting action research approach, they proposed an environmental management system solution purposefully for the attention of management within some contracting organizations.

Liyin et al. [65], like Tan et al. [28], acknowledge that construction organization's environmental management system is driven by external forces such as legal enforcement and governmental incentives. However, the authors argue that the effectiveness of such environmental management practices cannot be gained if internal motivation does not exist. Therefore there is the need for and environmentally-friendly culture to be maintained within the organization. It is therefore important to note that construction organizations need to target having such an atmosphere within their organization in order to realize long term establishment of ESC.

Since practicing of sustainable construction requires change in traditional practices and the introduction of innovations in construction activities, there will be the need for structural adjustments within an organization in the long term. The project manager's skills and knowledge in ESC, for instance, is crucial in delivering sustainable construction [52]. In Ghana the procurement law [66] which regulates construction procurement in Ghana, highly recognizes the position and reinforces the role of the project manager for the client in the management of public procurement. Since construction organizations also invariably utilizes the services of project managers, managerial decision has to be taken to ensure that existing or new project managers are well equipped with the requisite knowledge and skills to be able to operate within acceptable standards of sustainable construction.

CONCLUSION

Giant strides have been taken in developed countries on the establishment of sustainable development principles to guide activities of the construction industry. Across the developing countries sustainable construction is not established. Environmental sustainability is foundational in establishing sustainable construction in a developing country context. This requires the immediate attention of frontline construction industry stakeholders such as construction organizations. Thus, the overarching need to investigate into how to enable construction organizations to adapt to environment sustainable construction (ESC).

National environmental regulations and policies exist and can be regarded as enablers of ESC. In developing countries. However, governmental initiatives are not adequate to solve the environmental problems faced in developing countries. Existing government policies have not proved sufficient to deal with the environmental challenges associated with construction industry's activities in developing countries. Therefore, the need for the construction industry to take up the leadership role to ensure adaptation to environmental sustainable construction practices is becoming increasingly critical. This is especially so because conformance to sustainability practices and principles seem to be lacking among construction industry practitioners in Ghana, a developing country [40] Leadership and innovation from construction organization businesses in developing countries is vital to making progress [29].

The realization of existence of 'initial high cost' challenge associated with ESC requires local construction organizations' collaboration with government and other relevant bodies, both internationally and locally. This seem to be a necessary ingredient for adapting to ESC practices.

A conventional content analysis of the qualitative data obtained from the interview has revealed some construction organizations ESC primary elements and enablers. Some of ESC challenges that emerged include perception of associated high initial cost of practicing ESC coupled with lack of awareness of sustainable construction technologies and associated benefits. Governmental laws and regulations as well as governmental incentives have also been realized as primary enablers of ESC. The incorporation of sustainability requirements into the tendering selection criteria and then inclusion in contractual requirements for which execution thereof would not affect contractors' short term profit also emerged. These are considered as potential ESC drivers and require further investigation.

In light of these identified primary elements of ESC, a relational model was developed to indicate the path towards commencing construction organizations adaptation to ESC in developing countries. The relational model formed a basis for development of a conceptual framework of construction organizations ESC enablers in short-term, medium-term and long-term. This framework paves a clearer path towards the development of a broader framework required to enhance total adaptability of construction organizations to the ESC in a developing country context.

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