



## Implementation of Environmental Sustainable Construction Principles (ESCPs) in the Ghanaian Construction Industry

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### ABSTRACT

Although the concept of environmental sustainability provides benefits, most construction industries are seen to have little knowledge on environmental sustainable construction principles. This study was conducted to explore environmental sustainable construction principles applicable in the Ghanaian construction industry. The research specifically studied thirty-three (33) registered DIK1 contractors within the Accra Metropolis, identified the various environmental sustainable construction principles applicable in the Ghanaian Construction Industry, benefits associated with the adoption of environmental sustainable construction principles, challenges to the adoption of environmental sustainable construction principles in the construction industry, and measures that can be put in place to ensure the smooth implementation of environmental sustainable construction principles. Questionnaires were used in the study. Findings from the study revealed that minimization of resources consumption, improved indoor air quality and prevention of environmental health problems were among the key environmental sustainable construction principles applicable in the Ghanaian Construction Industry. Promotion of efficiency and healthy work environment, increased awareness of environmental impact of operations among employees, and conservation of water and the environment were also among the benefits perceived to be associated with the implementation of environmental sustainable construction principles. Key among the challenges identified were lack of sustainability measures by stakeholders, inadequate knowledge of the concept, and lack of capacity of construction sectors to implement environmental sustainable construction principles. As part of the measures to improve the adoption of ESCPs, there should be established governmental policies and personnel to promote environmental sustainable construction principles, and there should be the creation of awareness of the principles among staff in Ghanaian Construction Companies.

**Keywords**— environmental sustainable principles, Ghana, sustainable construction

### I. INTRODUCTION

Although the concept of environmental sustainability provides benefits such as cost reduction and savings as a result of waste minimization, recycling and savings from reduction in usage of electricity, water, gas and raw materials, most construction companies are seen to have little knowledge on environmental sustainable construction principles. According to David [1], construction activities are stretching to the limit of the earth's carrying capacity, and its ability to provide the resources required to sustain life while its ability to retain the capacity to regenerate remain threatened. For example, it has been identified that construction of buildings account for one-sixth (1/6) of the world's fresh water, one-quarter (1/4) of the wood harvest and two-fifth (2/5) its material and energy flows [2]. Mustapha [3] suggested that the government should use incentives and policies to increase the use of sustainable materials in the construction industry from twenty (20) per cent to sixty (60) per cent. It is evident in Ghana that, in spite of measures put in place by the Environmental Protection Agency (EPA) to protect the environment from construction activities such as road construction, building construction, construction of bridges and others, most construction companies who undertake various construction activities do not consider environmental sustainable principles and there is a general lack of knowledge about these principles among the construction professionals. This study identified environmental sustainable construction principles applicable in the Ghanaian construction industry.

### II. OVERVIEW OF THE GHANAIAN CONSTRUCTION INDUSTRY

The Ghanaian construction industry is concerned with infrastructural development and the development of the general built environment of the country. It can be described as diverse, complex and dynamic with increasing uncertainties with regard to technological developments, the national budget and resource availability [4]. The Ghanaian Construction Industry was developed along lines similar to the pattern in Britain when the bricklayers acted as master builders in an organization. The industry, like those over the world, has attained a broad spectrum of employees making it a labour intensive industry [5]. Companies within this industrial sector operate in a constantly changing environment in the face of volatile economic environment, shifting political climate and a highly competitive market [4]. Political independence in 1957 saw the establishment of the Ghana Highway Authority (GHA), the defunct State Construction Corporation (SCC) and the Architectural and Engineering Services Limited (AESL) to take over the formal construction sector [6]. Construction industry contributes to twenty-two percent of industrial output and three percent of GDP [7]. It also contributes about two percent of employment of the country's labour force. In terms of the level of skill of persons employed by the sector, sixty-seven percent are unskilled, twenty-five percent are semi-skilled and eight percent are highly skilled [8].

### III. ENVIRONMENTAL SUSTAINABLE CONSTRUCTION PRINCIPLES IN THE CONSTRUCTION INDUSTRY

According to David [1], environmental sustainability principles are principles that are set aside to meet the resources and resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystem to continue to regenerate the services necessary to meet those needs nor by our actions, diminishing biological diversity.

According to Matthew et al. [9], it is estimated that by 2056, global economic activity will have increased fivefold, global population will have increased by over fifty percent, global energy consumption will have increased nearly threefold, and global manufacturing activity will have increased at least threefold. Globally, the building sector is arguably one of the most resource intensive industries. Building material production consumes energy, the construction phase consumes energy, and operating a completed building consumes energy for heating, lighting, power and ventilation. In addition to energy consumption, the building industry is considered as a major contributor to environmental pollution [10], a major consumption of raw materials, with 3 billion tons consumed annually or forty percent of global use [11] and produces an enormous amount of waste [12].

A review of literature revealed six (6) major Environmental Sustainable Construction Principles (ESCPs) which may be applicable in the Ghanaian construction industry and are discussed to include the following:

#### A. *Minimization of Resources Consumption*

Minimizing the resource consumption addresses the demand side, looking at how the goods and services required meet basic needs and improve quality of life such as food and health, shelter, clothing, leisure and mobility—can be delivered in ways that reduce the burden on the Earth's carrying capacity [13]. Resource consumption implies that the consumption of current generations as well as future generations improves in quality. Such a concept of consumption requires the optimization of consumption subjected to the maintenance of services and quality of resources, and the environment over time. Resources consumed by the construction industry in Ghana include timber, water, stone and sand. By implementing the principle of minimization of resources in the construction industry, some of our resources can be preserved for future use.

#### B. *Reduction of Waste and Maximization of Resources Reuse*

Whenever a building is constructed, it imposes loads on the environment in various forms namely: resources depletion and contamination of air, soil and water [14]. These loads are generated while various demands, such as materials and energy, are met to furnish the designed building. In addition, the construction industry contributes a large amount of waste to the municipal solid waste stream each year. Cole and Larsson [15] suggested that the generated waste causes depletion of already diminishing natural resources, causes air and water pollution from waste that is improperly disposed of and put pressure on premium landfill space. The best approach to manage construction waste resource is to reduce waste and maximize reuse. In order to maximize reuse, various steps should be taken by the states, the local governments, such as the district assemblies and the project owners.

#### C. *Use of Renewable and Recycled Resources*

The use of renewable and recyclable resources will help to conserve resources and prevent loss of biodiversity, ecosystem, and rainforest [16]. Gao et al. [17] verified that the energy consumption for producing new construction materials by using recycled materials can be lower than using new materials and that the energy savings by reusing components can even be higher than by recycling building materials.

#### D. *Pollution Prevention*

Measures taken to prevent pollution during the manufacturing process can contribute significantly to environmental sustainability. Kibert [13], suggested that selecting materials manufactured by environmentally responsible companies encourages their efforts at pollution prevention. Although these products may have an initially

higher “off-the-shelf” price, choosing products that generate higher levels of pollution exploits the environment [18]. Pollution comes in the form of air, water and soil. However, emissions to soil are hardly discussed in any literature, and the data available are very limited. In the building industry, soil pollution is mainly a problem at the construction site. It may also be a problem in the extraction of some minerals, when the waste is deposited, especially hazardous waste. Water is used in large quantities in many manufacturing processes, especially in the production of paper, cement, and metals [19].

#### ***E. Avoidance of Environmental Health Problems***

The use of toxic materials are highly hazardous to construction workers and building occupants. Many materials adversely affect indoor air quality and expose occupants to health hazards. Some building materials, such as adhesives, emit dangerous fumes for only a short time during and after installation; others can contribute to air quality problems throughout a building’s life [18]. By using building materials with lower or non-existent levels of toxic substances, environmental health problems can be avoided. Material toxicity is of increasing concern with the growing number of building products containing petroleum distillates. These chemicals, known as Volatile Organic Compounds (VOCs) can continue to be emitted into the air long after the materials containing them are installed [20].

#### ***F. Improvement of Indoor Air Quality***

According to Organization of Economic Cooperation and Development [21], the successful implementation of this principle, in an integrated manner, will produce a sustainable architecture that will, increase comfort and create healthier environments for people to live and work.

## **IV. BENEFITS ASSOCIATED WITH THE ADOPTION OF ENVIRONMENTAL SUSTAINABLE CONSTRUCTION PRINCIPLES IN THE CONSTRUCTION INDUSTRY**

The adoption of Environmentally Sustainable Construction Principles (ESCPs) as frameworks for integrating corporate environmental protection policies, programs, and practices is mounting among both domestic and multi-national companies around the world. Many companies that adopt and abide by the ESCPs follow industry standards and maintain the nature of the environment. Environmental sustainable construction can be achieved based on willingness and ability of construction companies to drive change [22]. Formulation of policies that give change to the environment are required to govern the activities of professionals in the construction industry [23].

Although sticking to environmental sustainable construction principles in the construction industry could be very necessary, there are various factors which will lead an individual or construction firms in Ghana to implement these principles. Some of these factors are discussed to include the following:

#### ***A. Improving Environmental Responsibility in The Construction Supply Chain***

Clark [24] attested that many multinational construction companies adopt ESCPs in order to sustain and protect the natural environment from their construction activities. However, some do so in response to corporate pressure as more corporations adopt environmental sustainable construction principles. This pressure is driving environmentally friendly practices within the construction supply chain.

#### ***B. Increased Awareness of Environmental Impact of Operations among All Employees***

The awareness of environmental impact and of environmental sustainability principles among construction professionals in a company seems to be driving construction companies to identify construction impacts and find ways of mitigation [25].

#### ***C. Reduction of Environmental Dangers***

Morrow and Rondinelli [25] mentioned that ESCPs is adopted by construction companies in order to reduce their environmental dangers, increase the efficiency of operations by removing waste from production and distribution processes.

#### ***D. Promotion of Efficient and Effective Use of Resources in The Design***

Rayna Luther [26] pointed out that many construction companies adopt ESCPs in order to promote efficient and effective use of resources during the process of construction.

#### ***E. Conservation of Water Resources and the Environment***

Thormark [16] suggested that the effective and efficient use of materials that are renewed and recycled will help to conserve resources and prevent loss of biodiversity, ecosystem, and rainforest. This seem to be another reason behind the adoption of ESCPs.

#### ***F. Increasing Efficiency in A Healthy Work Environment***

The adoption of Environmental Sustainable Construction Principles in various construction industry will highly contribute positively to better up the quality of life within the built environment, work efficiency and healthy work environment [27].

## **V. CHALLENGES TO THE ADOPTION OF ENVIRONMENTAL SUSTAINABLE CONSTRUCTION PRINCIPLES IN THE CONSTRUCTION INDUSTRY**

In order to endorse and drive the agenda of environmental sustainable construction within the Ghanaian Construction Industry, the barriers that impede these practices must first be identified. Five major obstacles of ESCPs implementations have been identified from literature from various themes such as social, educational, directing, professional and human attitudinal challenges.

#### **A. Social Challenges**

The construction industry is a sector which is traditionally very difficult to change, especially with respect to construction methods practiced and building materials used. This change resistance results in poor demand for sustainability measures by stakeholders. Williams and Dair [28], in their own way stated that lack of sustainability measures by stakeholders is the most commonly recorded social challenge associated with the adoption of ESCPs.

The Toronto Green Development Standard [29] also acknowledges that a continual public awareness of sustainable concepts on sustainable construction and its benefits will lead to an increased demand compelling products to be tailored to their needs to be produced.

#### **B. Educational Challenges**

Among the educational challenges to the adoption of ESCPs is the inadequate knowledge about the concept. There have been several efforts to provide awareness, guidance and knowledge relating to environmental sustainable construction principles by academics, researchers and practitioners [30]. Despite the large amount of publications done by researchers, it seems educational issues appear to be the most common challenge to environmental sustainability practices.

#### **C. Capacity / Professional Challenges**

Lack of capacity of construction sectors to implement the environmental sustainable principles is one of the key challenges to the implementation of ESCPs. CIB Report [31] attested that the critical challenge to the implementation of environmental sustainable construction principles is the inability of the construction sectors to actually implement environmental sustainable practices. This is further reiterated by [32] that environmental sustainable construction principles can be hindered by ignorance. This presupposes that professionals within the built environment need to be fully acquainted with environmental sustainable construction principles in order to implement its practice [33].

#### **D. Direct Challenges**

A major characteristic of the construction industry is the involvement of a large number of individuals ranging from clients to the builders, thus an effective directing will be required to implement environmental sustainable construction principles in the construction industry. The challenge here is in the form of inadequacy of governmental policies and support. Stakeholders who are responsible for the enforcement of environmental

sustainable construction principles in the construction industry have been found to be in shortage [34]. Measurement tools have been developed in some advanced countries to measure the application of environmental sustainable construction principles in construction firms. Popular amongst them is the Leadership Establishment of Environmental Development (LEED) for the US and BREEAM for the UK. Hakkinen and Balloni, [32] mentioned that, lack of methods is a challenge, but methods as such do not improve the sustainability of built environment. The impact will depend on the implementation methods.

#### **E. Human Attitudinal Challenges**

Among these challenges is conflict with firms' objectives. Companies have objectives but many of these objectives are not aligned with the concept of environmental sustainable practices. Many see the need to include environmental sustainability principles in their activities as conflicting with the objectives of the firm [35]. Based on studies carried out by [36], and [37], some of these factors are lack of transparency, cultural change, lack of team spirit, lack of self-criticism, lack of cooperation, poor housekeeping, misconceptions about environmental sustainability practice, over enthusiasms, seen as too complex and unfamiliar, and fear of unfamiliar practices.

## **VI. RESEARCH METHOD**

The study sought to explore the environmental sustainable construction principles applicable in the Ghanaian construction industry. To achieve this aim, a structured questionnaire survey which involved both open and closed-ended questions was conducted on some key professionals working with 33 D1K1 construction firms who were purposively selected from the Accra Metropolis. The questionnaire administered to the respondents was divided into 5 main sections. The first section sought information about the background of the respondents, the second section sought to assess the views of the respondents on environmental sustainability principles applicable in the Ghanaian Construction Industry, Section C sought to assess the views of the respondents on the benefits associated with the implementation of environmental sustainable construction principles, Section D sought to assess the views of the respondents on the challenges to the implementation of environmental sustainable construction principles and the final section sought to identify measures that can be put in place to ensure the smooth implementation of environmental sustainable construction principles by Ghanaian construction professionals.

Data from the survey was analyzed by percentages and mean score rankings. A factor with a mean score of 2.5 and above was considered significant for the purposes of this study.

## VII. RESULTS AND DISCUSSION

The rate of responses from the respondents was an excellent representation of the strata and could therefore be used as the basis for analysis. This is because twenty-eight (28) questionnaires out of thirty-three (33) administered to the professionals within the construction firms were retrieved, indicating a total response rate of 85%.

### A. Profile of Respondents

The findings from the study revealed that among the respondents who answered the questionnaires, 39% of them were site engineers, 25% were Quantity Surveyors, 25% were also Architects and 11% were Project Managers. The number of years one stays in a particular work add up to their experience. Drawing from this, there was a need to know how long the respondents had been in professional work to determine their level of experiences over the years. The findings showed that 46% of the respondents had worked for their various firms for a period of 5-10 years, and 20% had been with their firms for over 10 years. The remaining respondents however, had been with their firms for less than five years. This notwithstanding, it can be said that about 66% of the respondents had worked between 5 to 20 years which makes their views very credible to be considered in this study.

### B. Environmental Sustainable Construction Principles Applicable in the Ghanaian Construction Industry

The views of the respondents were sought on the Environmental Sustainable Construction Principles that are applicable in the Ghanaian Construction Industry. Table I shows the responses of the various respondents interviewed. Table I shows that the mean scores of all the factors considered are greater than the mean value of 2.5. Thus, in the opinion of the respondents, all the six factors are ESCPs applicable in the Ghanaian Construction Industry. The results further show that 'minimization of resources consumption', 'improvement of indoor air quality', 'avoidance of environmental health problems', 'use of recycled materials', and 'waste reduction and maximization of reuse', are the key ESCPs applicable in the Ghanaian Construction Industry.

TABLE I  
ENVIRONMENTAL SUSTAINABLE CONSTRUCTION PRINCIPLES APPLICABLE IN THE GHANAIAN CONSTRUCTION INDUSTRY

No.	Construction principles	N	Mean	Std. deviation	Ranking
1	Waste reduction and maximization of reuse.	28	3.57	1.345	5 <sup>th</sup>
2	Use of recycled materials.	28	3.86	0.970	4 <sup>th</sup>
3	Prevention of Pollution	28	3.89	0.994	3 <sup>rd</sup>
4	Avoiding environmental health problems.	28	3.89	0.875	3 <sup>rd</sup>
5	Improved indoor air quality.	28	4.00	0.861	2 <sup>nd</sup>

6	Minimization of resources consumption	28	4.43	0.634	1 <sup>st</sup>
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Environmental sustainability principles are principles that are set aside to meet the resources and resilience, and interconnectedness that allows human society to satisfy its needs while neither exceeding the capacity of its supporting ecosystem to continue to regenerate the services necessary to meet those needs nor by our actions, diminishing biological diversity [1]. The findings obtained from this study corroborates literature which identified waste reduction and maximization, use of recycled materials, prevention of pollution, avoidance of environmental health problems, improving the indoor air quality and minimization of resources consumption to be key environmental sustainable construction principles in use. Kibert [13] found in his study that minimizing the resource consumption addresses the demand side, looking at how the goods and services required meet basic needs and improve quality of life such as food and health, shelter, clothing, leisure and mobility- can be delivered in ways that reduce the burden on the Earth's carrying capacity. In Ghana, the resources consumed include timber, water, stone, sand, etc. Resource consumption implies that the consumption of current generations as well as future generations improves in quality. Such a concept of consumption requires the optimization of consumption subjected to the maintenance of services and quality of resources and the environment over time. Improving indoor air quality according to [21], will produce a sustainable architecture that will, increase comfort and create healthier environments for people to live and work. In the case of prevention of pollution, studies have shown that selecting materials manufactured by environmentally responsible companies encourages their efforts at pollution prevention [13]. Although these products may have an initially higher "off-the-shelf" price, choosing products that generate higher levels of pollution exploits the environment [18]. Pollution comes in the form of air, water and soil. However, emissions to soil are hardly discussed in any literature, and the data available are very limited. In the building industry, soil pollution is mainly a problem at the construction site. It may also be a problem in the extraction of some minerals, when the waste is deposited, especially hazardous waste. Water is used in large quantities in many manufacturing processes, especially in the production of paper, cement, and metals [19].

### C. Benefits Associated with The Adoption of Environmental Sustainable Construction Principles

The views of the respondents were sought on the benefits which they thought could be associated with the adoption of sustainable construction principles in the Ghanaian Construction Industry. Table II shows the responses from the various respondents interviewed. Table II shows that the mean scores of all the seven benefits

associated with the adoption of ESCPs are greater than the mean value of 2.5. Thus, in the opinion of the respondents, all the seven factors are benefits that can be derived from the adoption of ESCPs in the Ghanaian Construction Industry. The results further show that 'promotion of efficiency and healthy working environment', 'increased awareness of environmental impact of operations among employees', 'conservation of water resources and the environment', 'increased efficiency of operations', and 'promotion of efficient use of resources in designing' are the key benefits associated with the adoption of ESCPs. The other benefits include 'ensuring that suppliers operate in environmentally and socially responsible ways', and 'reduced environmental dangers'.

The adoption of Environmentally Sustainable Construction Principles (ESCPs) as frameworks for integrating corporate environmental protection policies, programs, and practices is mounting among both domestic and multi-national companies around the world. The findings obtained from the survey corroborates literature which identified improved environmental responsibility in the construction industry [24], increased awareness of environmental impact of operations among employees [25], reduction in environmental dangers [25], promotion of efficient and effective use of resources in designs [26], conservation of water resources and the environment [16], and increased efficiency in a healthy work environment [27] to be among the key benefits associated with the adoption of ESCPs.

TABLE II  
BENEFITS ASSOCIATED WITH THE ADOPTION OF ENVIRONMENTAL SUSTAINABLE CONSTRUCTION PRINCIPLES IN THE GHANAIAN CONSTRUCTION INDUSTRY

No.	Benefits	N	Mean	Std. Deviation	Ranking
1	Reduced environmental dangers It ensures that suppliers operate in environmentally and socially responsibly ways	28	4.04	0.922	5th
2	Increased efficiency of operations Increased awareness of environmental impact of operations among all employees	28	4.07	0.900	4th
3	It promotes efficiency and healthy work environment	28	4.25	0.701	2nd
4	It promotes efficient use of resources in design	28	4.50	0.509	1 <sup>st</sup>
5	It helps to conserve water resources and the environment.	28	4.07	0.900	4th
6		28	4.11	0.737	3rd
7					

Many companies that adopt and abide by the ESCPs follow industry standards and maintain the nature of the environment. Environmental sustainable construction can

be achieved based on willingness and ability of construction companies to drive change [22]. Formulation of policies that give change to the environment are required to govern the activities of professionals in the construction industry [23].

#### D. Challenges to the Implementation of Environmental Sustainable Construction Principles

The views of the respondents were further sought on the challenges to the implementation of the ESCPs in the Ghanaian Construction Industry. Table III shows the responses from the various respondents interviewed. Table III shows that the mean scores of all the seven challenges to the implementation of ESCPs are greater than the mean value of 2.5. Thus, in the opinion of the respondents, all the seven factors are challenges that can affect the implementation of ESCPs in the Ghanaian Construction Industry. The results further show that, 'lack of sustainability measures by stakeholders', 'inadequate knowledge about the concept', 'lack of capacity of construction sectors to implement the environmental sustainable construction principles', 'lack of information sharing as common to stakeholder groups', and 'conflict with firm's objectives', are the key challenges to the implementation of ESCPs in the Ghanaian Construction Industry.

The findings agree well with literature which identified and summarized the challenges associated with the implementation of ESCPs to include lack of sustainability measures by stakeholders [28], inadequate knowledge of the concept [38], lack of capacity of construction sectors to implement the principles [31], lack of information as common to stakeholder groups [28], inadequate governmental policies and support [34]; conflict with firm's objectives [35] and knowledge deficit and lack of legislation [39].

TABLE III  
CHALLENGES TO THE IMPLEMENTATION OF ENVIRONMENTAL SUSTAINABLE CONSTRUCTION PRINCIPLES IN THE GHANAIAN CONSTRUCTION INDUSTRY

No	Challenges	N	Mean	Std. Deviation	Ranking
1	Lack of sustainability measures by stakeholders.	28	3.96	0.999	1st
2	Inadequate knowledge of the concept.	28	3.89	0.956	2nd
3	Lack of capacity of construction sectors to implement the environmental sustainable construction principles.	28	3.79	1.101	3rd
4	Lack of information sharing as common to stakeholder groups	28	3.64	0.951	4th
5	Inadequate governmental policies and support.	28	3.89	1.066	2th
6	Conflict with firms' objectives	28	3.54	1.232	5th
7	Knowledge deficit and	28	3.54	1.347	5th

lack of legislation

Identifying and dealing with these challenges will provide the platform for best measures to be put in place to ensure the smooth implementation of the principles.

#### **E. Improvement Factors for Environmental Sustainable Construction Principles**

The views of the respondents were finally sought on the measures that can be adopted to improve on the adoption of environmental sustainable construction principles. Table IV shows the responses from the various respondents interviewed. Table IV shows that the mean scores of all the five factors are greater than the mean value of 2.5. Thus, in the opinion of the respondents, all the five factors are measures which when adopted can improve on the implementation of ESCPs in the Ghanaian

Construction Industry. The results further show that 'establishment of governmental policies and personnel to promote environmental sustainable construction principles', 'awareness creation of environmental sustainable construction principles among staffs in companies', 'availability of information to all stakeholder groups', 'organizing orientation for new workers in the construction industry', and 'organizing continuous professional development courses for construction professionals through regular seminars, workshops, and refresher courses' are the five key measures that can be adopted to improve on the implementation of ESCPs in the Ghanaian Construction Industry.

TABLE IV  
MEASURES TO IMPROVE ON THE ADOPTION OF ENVIRONMENTAL SUSTAINABLE CONSTRUCTION PRINCIPLES IN THE GHANAIAN CONSTRUCTION INDUSTRY

No.	Improvement Factors	N	Mean	Std. Deviation	Ranking
1	Organize continuous professional development courses for construction professionals through regular seminars, workshops, and refresher courses	28	4.04	1.036	5th
2	Availability of information to all stakeholder groups	28	4.14	0.891	3th
3	Establishment of governmental policies and personnel to promote environmental sustainable construction principles	28	4.29	0.976	1st
4	Creation of awareness of environmental sustainable construction principles among staff in companies.	28	4.21	0.876	2nd
5	Organizing orientation for new workers in the construction industry	28	4.07	0.813	4th

## VIII. CONCLUSION

The study sought to explore the environmental sustainable construction principles applicable in the Ghanaian construction industry. To achieve this aim, four key objectives were set out to include the following: to assess the views of the respondents on environmental sustainability principles applicable in the Ghanaian Construction Industry; to assess the views of the respondents of the benefits associated with the implementation of environmental sustainable construction principles; to assess the views of the respondents on the challenges to the implementation of environmental sustainable construction principles; and to identify measures that can be put in place to ensure the smooth implementation of environmental sustainable construction principles by Ghanaian construction companies. A questionnaire survey was carried out to collect data that could assist in achieving the objectives set out. Findings from the study revealed that minimization of resources consumption, improved indoor air quality and prevention of environmental health problems were among the key environmental sustainable construction principles applicable in the Ghanaian Construction Industry. Promotion of efficiency and healthy work environment, increased awareness of environmental impact of operations among employees, and conservation of water and the environment were also among the benefits perceived to be

associated with the implementation of environmental sustainable construction principles. Key among the challenges identified were lack of sustainability measures by stakeholders, inadequate knowledge of the concept, and lack of capacity of construction sectors to implement environmental sustainable construction principles. As part of the measures to improve the adoption of ESCPs, there should be established governmental policies and personnel to promote environmental sustainable construction principles, and there should be the creation of awareness of the principle among staff in Ghanaian Construction Companies.

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