

**SUSTAINABLE DEVELOPMENT AND ITS IMPLEMENTATION ON CONSTRUCTION PROJECTS****\*Nwaneri Amanze Earlington**

Faculty of Civil Engineering, University of Leeds, United Kingdom

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**Abstract**

In this study, the existing knowledge of sustainability is reviewed based on study of previous journals, papers and information conducted previously. It seeks to explore the meaning of sustainability and sustainable development. This study will further reviewed to put in context sustainable construction and its implementation on the construction industry in United Kingdom. The advantages and impacts are further discussed with the challenges facing the implementation of sustainability in the construction practices.

**Keywords:** Sustainability, Sustainable Construction.

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**INTRODUCTION**

In order to have an understanding of what sustainability is and how it is applied in the construction industry, it is necessary to review the concepts of sustainability and sustainable development, how it originated and how it has evolved in subsequent years, its benefits and how sustainability performance is measured in the construction industry. In this study, the existing knowledge of sustainability is reviewed based on study of previous journals, papers and information conducted previously. It seeks to explore the meaning of sustainability and sustainable development. The literature is further reviewed to put in context sustainable construction and how it is being carried out in the construction industry in the UK. The advantages and impacts are further discussed with the challenges facing the implementation of sustainability in the construction practices.

**LITERATURE REVIEW****What is Sustainability?**

Sustainability as the name implies is associated with continuity and all the concepts of continuity. The term sustainability was coined from the Latin word 'sustenere' which means 'to maintain, continue, conserve, reserve, retain' (Cobb, 2009). According to ISO 15392 (2008) sustainability is defined as the '*state in which components of the ecosystem and their functions are maintained for the present and future generations*'.

The past four decades have experienced the increased awareness and importance of the concepts of sustainability and sustainable development all over the world. These concepts have gained wide acceptance politically and in many large institutions across the globe with the aim of managing issues regarding population growth and environmental changes (Tanner, 2012). Every human being has the right to a vital and well-conditioned environment.

This means that every human being should have access to good food, shelter, water and right to means of family size selection. In order for these to be achieved, steps have to be taken in creating activities to improve the quality and way of life. These activities are what (Brundtland Report, 1987) termed as 'development'. Thus development can be defined as innovative advancement towards enhancement of the quality of life. With development has come the diversion of the existing path of evolution different from what our ancestors had thousands of years ago. This is evident in the significant increase in the worlds' success of decrease in death rate, infrastructure, education, transportation, poverty alleviation amongst others. However the processes towards achieving the successes are telling on the planet and its capacity to withstand it. This shows that the development route adopted by most industrialized nations is completely unsustainable. Most organisations have restricted development to economic growth without considering the environmental and social aspects. Economic growth cannot take place on its own as most of the resources used are gotten from natural resources such as land, air, water, humans. The lowering of trade barriers has allowed for exchange of goods and services between nations as well as other natural resources which do not have any physical barrier such as the water ways. This shows that sustainability issues have gone beyond our immediate environments, because actions carried out locally have a way of affecting the surrounding environments as a result of the interdependence of countries. Alexandre et al (2007) stress that businesses need new mind-sets when considering sustainable development standards as part of their objectives. Thus it requires new ways of evaluating the performance of organisations. This involves the move from focus on economic activities to the social and environmental aspects with regards to meeting the required needs (organisation performance) with the poor having a balanced share in the natural resources for growth sustenance.

**Evolution of Sustainable Development**

The Brundtland Report titled 'Our Common Future' in 1987 fostered the awareness of the term sustainable development borne out of the need for balance between the ability of the world's growing population to cater for their needs and the capacity of the earth to handle the activities involved. The

report came up with the definition of sustainable development as *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'*. However the philosophy was too ambiguous stating the symptoms without giving clear cut measures on how sustainable development can be realized. Consequently there was need to put sustainable development philosophy in perspective which brought about subsequent events aimed at improving on the practicability of the Brundtland Report such as;

**Rio Earth Summit 1992:** in response to the Brundtland Report, an international conference was set up by the United Nations (UN) in Rio de Janeiro widely attended by representatives from approximately a 178 countries, numerous heads of states and voluntary societies. This summit saw to the development of Agenda 21 outlining the strategies for achieving sustainable development through integrating the social, economic and environmental factors. In effect the Commission of Sustainable Development (CSD) was instituted to ensure the implementation of Agenda 21 across all tiers of governance worldwide. As a result, a target was set for adoption of Agenda 21 by the UK government in the year 2000 which gave rise to release of documents and strategies aimed at implementing the objectives of the Agenda in the UK. Consequently a national strategy for sustainable development in the UK was first released in 1994. The years 1992 and 1997 saw other conferences such as *Maastricht Treaty* and *Kyoto Conference on Global Warming* respectively.

**1999: A Better Quality of Life-** a strategy for sustainable development for the UK was published in May, 1999 (DETR, 2000) stating the commitment of the UK government towards guaranteeing a better quality of life for the present and future generations through meeting the four objectives stated below as identified in the publication:

- Social progress which recognizes the needs of everyone;
- Effective protection of the environment,
- Prudent use of natural resources;
- Maintenance of high and stable levels of economic growth and employment

**Johannesburg 2002:** A World Summit on Sustainable Development was held in Johannesburg following 10 years after the Rio conference without any major success in implementing sustainable development principles. The summit was aimed at making sustainable development a reality. At the end of the conference, substantial commitment was gotten from the different governments towards alleviating poverty and protecting the environment. Commitments were made towards increasing access to clean water and appropriate hygiene, enhanced agricultural practices, better health conditions, reduction in production of toxic chemicals and use of renewable energy. To this effect, targets were set to ensure the commitments were not just mere words and partnerships were established to facilitate the implementations of the policies agreed on. The better quality of life strategy was reviewed in 2005 as *Securing the Future* to incorporate changes that had taken place within the UK (DEFRA, 2005). As a result a new strategy was set with five principles guiding it and four priority areas were identified as 'sustainable consumption and production, climate change, natural resource protection and sustainable communities. The figure below gives a summary of the five overarching principles in the new

strategy of securing your world (Zainul-Abidin, 2005 and Abolore, 2012).

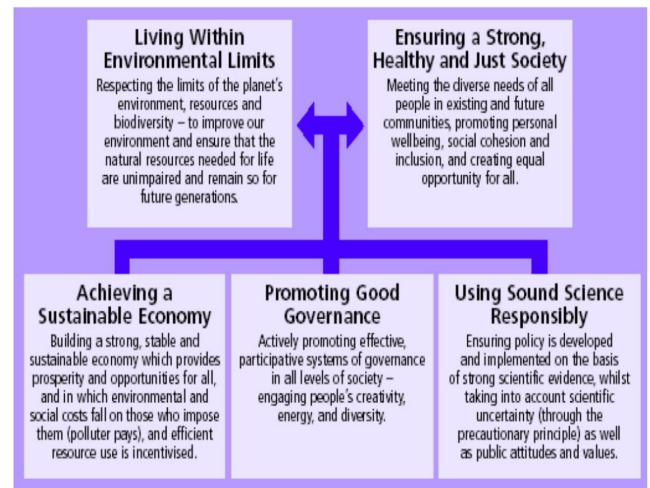
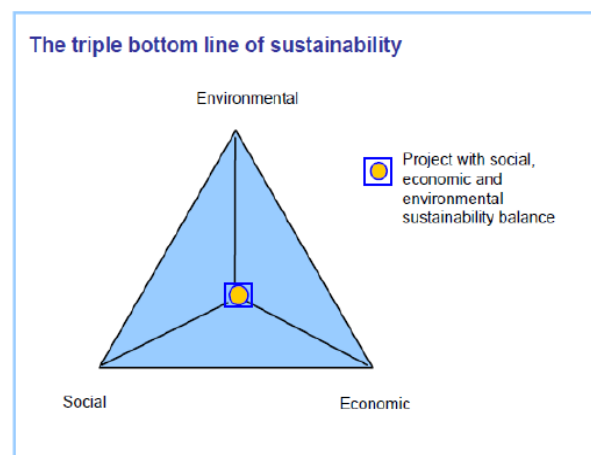


Figure 1. Principles for Sustainable Development (Securing the Future, 2005)

### Definitions of Sustainable Development

The term sustainable development is quite vast and attracts various interpretations to suite with specific situations. For instance, sustainable development to the economist is seen as sustainable economy, to the environmentalist it is seen as sustainable environment and to the architect it is seen as sustainable design. However the most common definition remains that of the Brundtland Report. The International Council for Local Environmental Initiatives ICLEI (1996) defines sustainable development as a process of improvement focused on delivering economic, social and environmental outputs to a community whilst maintaining a balance of the natural, built and social systems involved. OGC (2007) defines sustainable development as *'the achievement of a better quality of life through the efficient use of resources which realize continued social progress while maintaining stable economic growth and caring for the environment'*. Construction Excellence (2004) defines sustainable approach as pursuing profitability without straining the environment and society. Thus sustainable development is frequently referred to as the triple bottom line (TBL) due to its obligation to deliver economic, social and environmental goals as shown on figure 2 on the next page.



Source: Constructing Excellence, 2004

Fig. 2. The Triple Bottom Line of Sustainability

From all the definitions stated above, possible conclusions can be made by asserting that sustainable development in simple terms means meeting the basic needs of individuals or group of individuals with balanced consideration of the impacts of socio economic and environmental factors, while delivering functions required without affecting the future ability to make use of those resources. Put in another way this emphasizes a shift of focus from economic prosperity only to considering the impacts of the processes on the environment and well-being of the society. Sustainable development however does not imply total slowdown of development (technology), but rather it emphasizes on placing limits on which technology is managed such that the future generation is not deprived of enjoying a decent environment.

Brundtland Report (1987) admits that there is no definite model to tackle sustainability issues due to the differences in economic, social and environmental conditions worldwide. This has led to the different interpretations given to sustainability and thus the various methods and ways of dealing with sustainability issues. However, the report advocates that in developing sustainability policies to suit specific nations, organisations and sectors, a consensus judgment should be used while maintaining a balance between economic, social and environmental factors. If this concept is adhered to by everyone, then the planet can be sustained as all the activities carried out by individuals have the potential for self, local, regional and global effects.

**Elements of Sustainable Development**

The elements of sustainable development as represented in the triple bottom line include:

**Economic sustainability:** this means making profits through effective usage of resources, such has human resources, water, energy and materials. Harris (2003) asserts that an economically sustainable system must have the potential of continuous yield of goods and services without creating imbalance.

**Environmental sustainability:** OGC (2007) asserts that this is the most recognized element of sustainable development. It involves efficient use of natural resources and guarding the environment against pollution and degradation as well as making use of renewable resources thus creating a balance in ecosystem, through conserving biodiversity and atmospheric stability.

**Social Sustainability:** Social sustainability is about ensuring that there is access to basic needs such as food, shelter, education and health facilities (Nwokoro and Onukwube, 2011). The emphasis here is the consideration of the needs and expectations of the stakeholders involved and how it affects the community, their cultures and values (Carroll, 1979). This is what most companies term as the corporate social responsibility (CSR), showing that every company has a responsibility to ensure ethical principles are applied in their business processes putting into consideration how their economic decision making impacts the social, environmental state of the stakeholders involved. In general terms, social sustainability has to do catering to the social needs of individuals (OGC, 2007) such as health, education, food, shelter, equal rights of opportunities, gender equality, right to vote and be voted for. Figure 3 classifies some of the factors that make up the TBL, although this is not an exhaustive list.

Environmental issues	Social issues	Economic Issues
<ul style="list-style-type: none"> <li>• Land utilisation</li> <li>• Material selection</li> <li>• Energy conservation</li> <li>• Water efficiency</li> <li>• Waste minimisation</li> <li>• Pollution control</li> <li>• Biodiversity and ecology</li> <li>• Transport</li> </ul>	<ul style="list-style-type: none"> <li>• Health and welfare</li> <li>• Safety issues</li> <li>• User comfort / satisfaction</li> <li>• Accessibility</li> <li>• Aesthetics / visual</li> <li>• Nuisance to neighbours</li> <li>• Social involvement</li> </ul>	<ul style="list-style-type: none"> <li>• Whole life cost</li> <li>• Image / business enhancement</li> <li>• Legislation compliance</li> <li>• Cost efficiency</li> <li>• Profitability</li> <li>• Risk assessment</li> </ul>

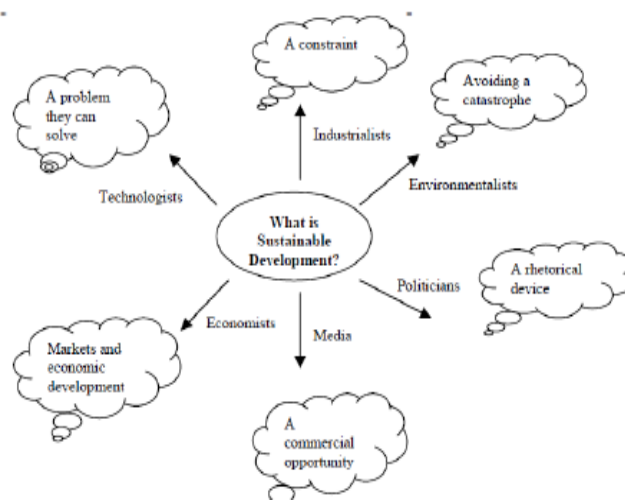
Source: Zainul-Abidin, 2005

**Figure 3. Sustainability issues categorized under the three themes**

Despite the awareness to integrate the three elements of sustainability to yield better results, organisations are still faced with the challenge of making this concept practical. Abolore, (2012) suggested that approaches have to be formulated to ensure the practicability. This is evident in the statement made by Demos & Green Alliance (2003) cited in DEFRA (2005)

*‘Information does not necessarily lead to increased awareness, and increased awareness does not necessarily lead to action. Information provision, whether through advertisements, leaflets or labelling, must be backed up by other approaches.’*

As a result of this, different approaches have been established by different sectors to deliver sustainable development of which construction industry plays a key role. Figure 4 below gives a brief picture of what sustainable development means to different sectors. However the main focus of this research is on the construction industry which will be discussed in detail in subsequent sections.



**Figure 4. Images of Sustainable Development (Chaharbaghi and Willis, 1999)**

**Sustainable Development and the Construction Industry**

Green construction, sustainable buildings and sustainable construction are terms commonly associated with sustainable development. So what exactly is sustainable construction? In order to answer this question, there is a need to have an overview of the construction industry and how its practices impact on sustainable development. Construction industry is a major industry in the world and plays a significant role towards

development and has a high gross domestic product (GDP) index (Crosthwaite, 2000; Strassman, 1970; Drewer, 2001). GDP is defined by (ONS, 2013) as a 'summary indicator' of the economic activities of a region which acts as a terms of reference when growth is being measured'. The construction industry involves the production, development, planning, designing, building, altering or maintenance of the built environment. The major players include the clients, contractors, manufacturers, end users, constructors, designers, facility managers. The activities involve tendering, site planning and material selection, location of site, recycling and waste management (Khalfan *et al.*, 2002). The output from the construction industry in UK forms an essential part of the GDP which is 8% (HM Government, 2008) and in turn forms a part of the national accounts (ONS, 2013). The construction industry is labour intensive and indisputably has the capacity to accelerate development and cater directly for human needs through employment of labour, open up channels for investments internationally. According to (HM Government, 2008) it produces an annual output of 100 billion pounds and employs about 3 million workers. Other firms depend on the performance of infrastructures such as roads, railways, power stations, telecom networks in order to remain competitive. The performance of the construction sector also has a direct effect the determination of investment locations by external and internal investors (HM Government 2008). All these add up to boost the productivity of economy. However the construction industry practices constitute the greatest adverse impacts on the natural environment (Woolley, 2000; Persson, 2009; Abolore, 2012). This is as a result of its massive usage of non-renewable resources, consequently producing significant waste, causing air/water pollution and leading to degradation of soil. Hayles et al (2003) concur that construction utilizes 40 per cent of natural resources and 30 per cent of energy in UK. The construction industry also has been known to be complex and fragmented and as a result has a high percentage of inclination to resist changes proposed by sustainable development (Persson, 2009). The Egan Report (1998) played a key role in reviewing the progress of construction industry in the UK and it identified five key drivers for change in the UK construction industry which are:

- Commitment of leaders
- Focus on Customer
- Integrated process and teams
- Agenda focused on delivering quality
- Commitment to people

Even though the report was not clearly titled sustainability, the drivers and the philosophy behind the report were clearly towards achieving sustainability in construction. This is evident in the multiple uses of the phrases '*sustained improvement*', '*sustaining improvement*' and in the statement 'Nonetheless, The report also called for the use of waste elimination and value adding techniques in order to sustain the construction process improvements. This involves the use of tools applied in other industries such as manufacturing and services industries. Some examples amongst others of such tools are the Value Management tools, Total Quality Management, Just-In-time, Lean production, CALIBRE, and Benchmarking.

### Sustainable Construction

Knowledge of the concept of sustainable development enhances the understanding of sustainable construction

(Nwokoro & Onukwube, 2011). Thus sustainable construction derives from putting the concept of sustainable development in the context of construction industry to come up with issues specific to the construction sector and its practices by being more responsible in its actions. Thus it can be said that sustainable construction is a subset of sustainable development (Khalfan *et al.*, 2002; Atkins, 2001). However in contextualising the concept of sustainable development, it should be seen as a holistic approach considering the economic, social and environmental impact it has on the human life and thus striking a balance by relating sustainable construction back to the triple bottom line. A project is said to be sustainable when it performs its functions with little or no opposing impact on the environment and at the same time boosting economic and socio-cultural activities at all levels of existence (Bethge, 2009). Hence the primary aim of sustainable construction lies within identifying and seeking ways to meet the needs of all the stakeholders involved in the project without closing up on the opportunity of the future generation to meet their needs with these limited natural resources. Stakeholder was defined by Freeman (1995) as any person or group of people that has an impact and is also impacted by the outcome of the organization's practices towards meeting its objectives. The awareness of the power and influence of stakeholders on the outcome of projects thus signposts that 'we need to develop tools and techniques to ensure their inclusion in our strategic decision making process and business development activities' (Krisen, 2013). Hence the stakeholders must be identified and as well as their seeming stake in the project. Some of the stakeholders to be considered in any construction project include the workers, community, supply chain, shareholders, owners, end users and the public. DETR (2000) further emphasizes that sustainable construction goes beyond meeting the needs of individuals in new ways to ensuring it is accepted by the society. According to Kibert (1994) sustainable construction envisions the application of ecological and resourceful principles to create a dynamic environment towards achieving the goals of sustainable development (Lanthing, 1995). This can be achieved through implementation of a more collaborative working condition as illustrated in the Egan Report: *Rethinking Construction* where the supply chain has a uniform understanding of what is expected of them in the sustainable delivery of the project. This will then influence appropriate decision making in terms of the choice of materials, design and proper waste management for improved performance. Khalfan et al. (2002) argue that sustainable construction can only be achieved by changing the process of delivering construction projects from a linear to a cyclical process. This includes all the activities ranging from the extraction of raw materials through to planning, design, construction, use, deconstruction and waste management (Tan *et al.*, 2011).

### Principles of Sustainable Construction

In a bid to set the sustainable development strategies in action Kibert (1994) has identified six principles guiding sustainable construction;

1. Reduced consumption of resources
2. Increase towards reusing resources
3. Maximization of eco-friendly and renewable resources
4. Preservation of the natural environment
5. Build a healthy and non-hazardous environment
6. Pursue quality in creating the built environment

The above six principles proposed suggest the manner in which construction practices should be carried out, but it has failed to demonstrate how this should be done. The terms reduce, maximise, preserve, build and pursue are all very subjective and could be interpreted to mean different things by different people thus not necessarily providing a standard for measurement of progress towards achieving sustainability. However they are starting points in creating a consciousness that practical steps need to be taken in achieving the goal of sustainability. For a sustainable construction to be achieved, all the criteria mentioned above should be considered in a balanced manner. This should be considered from the inception of the project when making decision to go with a build solution, throughout all the stages of design, procurement, construction, commissioning, operation/ maintenance and up to the demolishing stage (Atkins, 2001). Corfe (2013) buttresses this fact stating that lifecycle considerations should be applied when considering sustainable projects whether in terms of the cost, carbon reduction social or beneficial aspects. Also he stated that holistic approach should be adopted by integrating the three themes of economic, environment and social sustainability. Hayles et al. (2003) recommend the use of best practice and government regulations to facilitate the implementation of SD principles. The UK government came up with better strategies to enhance sustainable construction in order to bring to reality the sustainable development strategies (HM Government, 2008). It sets out to change the pattern in which construction practices are carried out and the attitude of all the participants towards sustainability through;

- Efficient use of resources to amass profitability.
- Firms securing opportunities offered by sustainable products or ways of working
- Enhancing company image and profile in the market place by addressing issues relating to corporate and social responsibility.

<b>Procurement</b>	To achieve improved whole life value through the promotion of best practice construction procurement and supply side integration, by encouraging the adoption of the Construction Commitments in both the public and private sectors and throughout the supply chain.
<b>Design</b>	The overall objective of good design is to ensure that buildings, infrastructure, public spaces and places are buildable, fit for purpose, resource efficient, sustainable, resilient, adaptable and attractive. Good design is synonymous with sustainable construction. Our aim is to achieve greater use of design quality assessment tools relevant to buildings, infrastructure, public spaces and places.
<b>Innovation</b>	To enhance the industry's capacity to innovate and increase the sustainability of both the construction process and its resultant assets.
<b>People</b>	An increase in organisations committing to a planned approach to training (e.g. Skills Pledges; training plans; Investors in People or other business support tools; Continuous Professional Development (CPD); life long learning). Reduce the incidence rate of fatal and major injury accidents by 10% year on year from 2000 levels.
<b>Better Regulation</b>	A 25% reduction in the administrative burdens affecting the private and third sectors, a 30% reduction in those affecting the public sector by 2010.
<b>Climate Change Mitigation</b>	Reducing total UK carbon dioxide (CO <sub>2</sub> ) emissions by at least 60% on 1990 levels by 2050 and by at least 26% by 2020. Within this, Government has already set out its policy that new homes will be zero carbon from 2016, and an ambition that new schools, public sector non-domestic buildings and other non-domestic buildings will be zero carbon from 2016, 2018 and 2019 respectively.
<b>Climate Change Adaptation</b>	To develop a robust approach to adaptation to climate change, shared across Government.

Source: HM Government, (2008)

Figure 5. The targets for sustainable construction in UK

In order to achieve these strategies, targets have been set with consideration of the 'ends' and the 'means' of construction. The 'ends' here referring to sustainability issues such as climate change, water, biodiversity, waste and materials while the 'means' refer to the processes of reaching the ends such as method of procurement, design, people involved, regulations and standards, innovation. Figure 5 gives the summary of the different targets with respect to the 'ends' and the 'means' shown on the next page,

### Benefits of Sustainable Construction

There are various benefits identified with sustainable construction which could either be tangible or intangible benefits or put in other way direct and indirect rewards (DETR, 2000). With the increasing demand for sustainable construction from clients, it indicates that only companies with proven records of sustainability will have access to contracts. In most of the countries, the Government is the biggest client in procuring infrastructures and in UK it accounts for up to 40%. As part of their requirements, sustainability plays a vital role and the targets have to be met in order to win the contracts. The manners in which companies operate have a direct influence on their image to the public. It also affects the rate at which the industry can attract and retain excellent employees. Thus there is a positive image accorded to companies that deliver projects sustainably and they stand a better chance of remaining competitive. The following are some of the benefits that can be obtained from sustainable construction (Hill and Bowen 1997; Parkin *et al.*, 2003);

- Cost effectiveness through efficient use of materials
- Improved relationship with clients, supply chain and employees, communities, end users.
- Less operational cost and resource depletion
- Reduced transportation cost
- Development of innovative design
- Improved quality of projects
- Effective procurement methods
- Improved health and safety leading to better performance
- Lesser disputes and better working conditions
- Better whole life assessment of projects.
- Gaining public support from the society

### Measuring Sustainable Construction

According to (Stanger, 2002) accounting for sustainability has been on a voluntary basis unlike financial accounting which is constitutional. However with the rising paradigm of sustainable construction there has been a need to also carry out sustainability accounting beyond mere voluntary measures. This is because the aim of reaching sustainable development cannot be achieved without measuring the performance of where we are today from where we were yesterday. Accounting for sustainability helps in the identifying loop holes as well as in the formulation of best practices through comparing and benchmarking the performances for the future generation. Measurement can only be carried out if there are certain criteria for which something is being measured. This can either be absolute such that there is a universal standard of measurement or it could be relative in cases where absolute measurements are not feasible. Integrating social, economic and environmental issues into sustainable development makes it multidimensional and more complex in balancing objectives.

This therefore makes it very subjective and requires a trade-off. Harris (2003) argues that the broad nature of sustainable development makes it difficult to come to analytical conclusions. The question of how sustainability can be measured then arises. Also considering the fact that sustainability issues vary from sector to sector and from regions to regions it is necessary to come up with goals and indicators (Fiksel *et al.*, 2012) pertinent to the sector. The goals here refer to the ends that need to be achieved which the sustainability requirements example is reducing the amount of water wasted during construction. The indicators refer to the summary of what has been or needs to be achieved in order to meet the goals.

The metric shows the unit in which the measurement is taken. This was also buttressed in the (Egan Report, 1998). Stanger (2002) stated that 'for construction industry to set goals that are clear with measurable objectives, quantifiable targets, milestones and performance indicators'. For this to be properly taken care of, criteria and methods such as the life cycle approach has to be used to obtain the data for each metric for analysis of the project (Fiksel *et al.*, 2012), since the impacts of building exists throughout the life span of the buildings (Bethge, 2009; Nwokoro & Onukwube, 2011). By so doing it will be easier to determine the different stakeholders involved at the particular points in the Lifecycle. Some of the environmental measurement standards available are BREEAM, CEEQUAL, Eco Homes and ISO 14001. According to (HM Government, 2008) the targets for sustainability in the UK are measured against the key performance index (KPI) set out by the Construction Excellence. DETR (2000) further divides the indicators into project performance and company performance. Project performance indicators include; Cost of construction, time of construction, certainty of project cost, certainty of project timing, satisfaction of client based on the product and services rendered. The company performance indicators include safety, productivity and predictability. Measurements are also carried out against the BREEAM standards to ensure compliance as well as use of mandatory procurement standards. The permanent secretary in most cases takes responsibility for ensuring that the plans are adhered to. The progress reports are carried out by the sustainable development commission (SDC) for clarity and transparency.

### Challenges of Sustainable Construction

The work of (Persson, 2009) highlights on the possible challenges towards implementation of sustainability in construction projects. This includes lack of pre-emptive procedures for tackling sustainability issues, gap between the real and apparent costs and lack of expertise in implementing sustainability. There is also the common misconception that sustainable construction implies more cost than regular construction projects that do not consider sustainability. This idea was countered by Abolore (2012) which states that 'there are no adverse side effects of applying sustainable development thinking to... projects'. DETR (2000) asserts that lack of commitment on the part of the client is a major barrier to implementation of sustainability. This is because the responsibility is majorly dependent on the commissioning client to see to it that sustainability is part of the requirements in delivering the project. Lack of understanding on the part of the design team also acts as a major barrier. The demand for over specification in design also leads to substantial waste generation in projects. In order to overcome these challenges,

there is a need for motivation and expertise advice for sustainability to be considered (Persson, 2009). Khalfan *et al.* (2002) state that issues facing sustainable development require long term and not only short term solutions. This implies that SD is a goal that needs to be achieved and as such requires objectives of achieving the goal on a long term basis. These objectives need to have measurement criteria in order to benchmark performance.

### Conclusion

Sustainable development has been defined as 'a development that meets the needs of the present without compromising the ability of the future generations to meet their own needs'. The quest for sustainable development has drawn attention to the construction industry and its practices. The construction industry plays a major role in the development of a nation which is evident in its contribution to economic growth measured by the gross domestic product (GDP). Majority of other sectors in a nation depend heavily on the outputs of the construction sector such as roads, buildings, railways, infrastructures and telecommunication in order to perform their own functions. However the practices of the construction sector have destructive effects on the environment and society because it utilizes substantial amount of natural resources and generates excessive waste. Several strategies have been developed to tackle sustainability issues, but to date there has been little agreement on how sustainable development can be implemented. The construction industry is faced with the challenge of translating strategic sustainability objectives into practical day-to-day activities at the project level due to the multi-faceted principles of economic, social and environmental factors involved and the lack of structured procedure to enable its implementation. The definition of sustainable development has focused on the macro level only and for this gap to be closed, it is essential to put in place methods and techniques to expedite sustainable decision making at all level of project delivery from conception through design to construction, use and deconstruction. The adoption of a lifecycle approach that considers the sustainable development principles at all stages of the project lifecycle should be encouraged. The conceptual maturity model for sustainable construction, the fourth phase which involves development of a structured and systematized framework for sustainable construction, which should include 'a clear vision and the tangible mission; data repository of previous projects; sustainability audit and reporting knowledge sharing platform' should be done. But yet the scope of sustainable development has not been reached to a large extent in the construction industry. This could be attributed several factors such as lack of awareness, lack of motivation, lack of systematic methodologies that promote successful implementation of sustainable development practices.

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