

## Sustainable Built Environment: The Role of Quantity Surveyors

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**Abstract:** The word sustainability is one of the World's most talked about but least understood word, this is because its meaning is often clouded by different interpretations. Sustainability embraces the preservation of the environment as well as critical development-related issues such as the efficient use of resources, continual social progress, stable economic growth, and the eradication of poverty. It is however, important to note that the roles of Quantity Surveyors in sustainability of built environment cannot be overemphasized. Ensuring sustainability in built environment involves a multidisciplinary and trans-disciplinary approach involving experts from different disciplines and stakeholders associated with construction sectors which include Quantity Surveyors in order to develop holistic and informed strategies that provide sustainable built environment. This paper examines the roles of Quantity Surveyors in ensuring sustainability in built environment, roles such as: sustainability strategy development, life cycle cost appraisal, advising on engineering services solutions, site visits, assessment and projections for future work. The paper also consider some of the challenges faced by Quantity Surveyors in ensuring a sustainable built environment, such as: less awareness in social responsibility, less awareness in sustainable construction, less influential ability that can make current expensive sustainable methods more economically viable in the future, lack of sufficient cost database for building services and products, lack of skill and knowledge on life cycle costing and life cycle assessment. It therefore recommended that Quantity Surveyors should continually upgrade themselves with relevant skill and knowledge in sustainable built environment and build up cost database on sustainable buildings.

**Key words:** Built environment, Cost Appraisal, Quantity Surveyors, Sustainability

### I. INTRODUCTION

It is now widely accepted that the construction industry is a major contributor to climate change, as it is responsible for almost half of the global greenhouse gases and consumes 40% of the materials entering the global economy (Asif et al., 2007). The issue of sustainable built environment cannot be overemphasized in recent times that the entire world is been faced with the global phenomenon of climate change and other environmental challenges.

Tackling environmental sustainability therefore require that a holistic approach should be sought by addressing all three principles of sustainable development namely social, economic and environmental. This is because relying on the collaboration of all stakeholders to quantify and interpret emissions throughout the building lifecycle is a key indicator of responsible use of resources and energy and this will go a long way in attaining a sustainable built environment (Sodagar and Fieldson, 2011). Sell (2007) established that, sustainable development has to be expanded beyond the construction industry by arguing that green buildings alone may be insignificant in the wider scheme and that to make sustainable design and construction practices worthwhile there must be balanced priorities between the construction industry, the community, individuals and the local and national government.

The main aim of sustainable design and construction is to reduce to the minimum the depletion of artificial resources like energy, and raw materials and in the same way ensure a built environment that are comfortable, safe and productive. Quantity Surveyors are in a very important position to assist in achieving their sustainable objectives over the life cycle of a project. The Quantity Surveyor is the key advisor at all stages of the property life-cycle and has sound knowledge on the technologies and innovations. In order, to integrate the principles of sustainability into built environment there are most some changes in design, procurement, and management processes, though these changes are not without some challenges faced by construction industry professionals in moving from traditional design and construction process to a new delivery method suitable for a sustainable built environment and these professionals include Quantity Surveyors.

There is no doubt at all that, Quantity Surveyors are the cost experts in the construction industry, therefore they have to be alive to traditional roles to ensure a sustainable built environment in addition with the ever changing construction trend to make them relevant in the construction industry. It is however unfortunate that, most Quantity Surveyors are not well equipped with knowledge and skills about sustainability and do not have sufficient data base for cost comparisons and estimation. This therefore calls for the Quantity Surveyors

and other professionals in the construction industry to redouble their effort in the way and manner building are constructed and the need to reduce cost escalations and construction time frame in order to produce buildings that can adapted well to our environment and also cost efficient.

The research methodology employed is literature review revealing the traditional roles of Quantity Surveyors and their roles in sustainable built environment which include among others life cycle costing value engineering and cost comparison of different building materials. In addressing the issue of sustainability in built environment; three research questions were looked into, these are, why the need for sustainable buildings, what is sustainable building all about, and how we can we obtain sustainable building? This paper in addition, x-rayed the challenges being faced by Quantity Surveyors in sustaining a built environment so as to remain relevant in today ever changing construction world.

## **II. CONCEPTUAL FRAMEWORK**

### **Concept of Sustainability and Sustainable Built Environment**

Sustainability is defined as a social progress that provide effective protection of the environment by prudent use of natural resources ensuring maintenance of high and stable levels of economic and employment (Mawhinney, 2002).

The word sustainability is one of the worlds most talked about but least understood word, this is because its meaning is often clouded by different interpretations. Sustainability embraces the preservation of the environment as well as critical development-related issues such as the efficient use of resources and ensures the health and vitality of human life and culture and nature's capital, for present and future generation. It is all about meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Sodagar and Fieldson (2011) posited that sustainable built environment can be achieved through the following:

- (i) sustainable clientship
- (ii) sustainable design
- (iii) sustainable services design
- (iv) sustainable cost management
- (v) sustainable construction
- (vi) sustainable operation
- (vii) sustainable deconstruction

### **Sustainable Client-ship**

The client or developer is the determining factor in the sustainability achieved by any project. They must show leadership to their design and procurement team and force innovation through their supply chain to provide more efficient, less polluting and cheaper buildings. This also requires managing the project in such a way as to promote good use of human resource and knowledge and the respect of the client for the values of the organisations it involves in building procurement alongside clear definition of its own values. This is a necessary part of the briefing process for a building; the design team must understand the client's budget, programme, functional requirements and corporate responsibility values to ensure that the building performs. Some developers may take the decision to absorb the additional cost of a sustainable design brief and use this demonstration of pro-activity as a marketing tool (Gazeley, 2008).

### **Sustainable Design**

Defining sustainable design as a philosophy will help to understand and identify the most appropriate design strategies which if applied to all aspects of design from inspection to completion should maximize quality and minimise impact (Sodagar et al 2007a). Different terms are being used for sustainable design including 'green architecture' 'climate responsive architecture', 'high-performance' and similar terms (Kibert, 2005). Kibert concludes that all have one key objective; to apply principles through the entire life cycle of construction, from planning to disposal. Some authors are radical in their views about the function of sustainable design by giving absolute priority to the environmental performance by arguing that sustainable buildings are not about fashion or style but about performance (Roaf et al 2004). Edwards and Hyett (2001) argue that in spite of recent development in low energy technologies the industry has not yet put sustainability at the heart of its operations. This view is supported by Guy and Moore (2005) who argues that the industry tends towards, for commercial reasons, to follow the minimum legal requirements when designing and building homes.

### **Sustainable Services Design**

Renewable or low to zero carbon technologies (LZC) can provide a significant percentage of the energy required for buildings located in appropriate environments, where sunlight, wind and biofuels are

plentiful. Many buildings, especially in cities can gain limited benefit from solar and wind power and biofuels could cause particulates air pollution therefore an alternative must be found. Many new and refurbishment commercial buildings have an opportunity to vastly improve energy efficiency through better use of airtight thermal construction, solar design and daylight management alongside flexibility of control and integration of services. Budget should always be targeted at maximizing efficiency before LZC technologies are incorporated as this has the largest potential to reduce the quantity of energy generation needed and cost to carbon saved ratios are more acceptable.

### **Sustainable Cost Management**

A sustainable building which does not function well in terms of space, facilities or social accessibility will be as much of an environmental burden through lack of utilization as a well-functioning building with a high operational carbon impact. The very basic assessment requires the calculation of capital or initial cost with running cost/maintenance; however the process is more complex requiring knowledge management alongside corporate responsibility evaluation to provide better decisions in cost evaluation for sustainability. Environmental design has a financial cost, and sometimes it has a social cost too. These costs must balance and be justified. In commercial construction, the cost of failing to address matters of sustainability can be embarrassing and costly in terms of prosecution, bad media coverage and loss of trade. Commercial stakeholders are being increasingly knowledgeable in environmental and ethical matters. Making cost comparisons for a whole building can be time consuming and costly in term of design consultancy fees.

### **Sustainable Construction**

Managing the construction process in a safe, efficient and effective way will usually save money and time, and much of this cost is related to fuel use and logistics. Employing modularisation and off-site construction methods to reduce performance uncertainties and risk of accidents on site has environmental benefits in terms of reducing waste of materials, transportation and can improve building performance in terms of air tightness and quality of finish too. The use of consolidation centres can save delivery frequency and protect materials from damage on site. Whilst the fuel used directly by the contractor is a small impact in the holistic approach, the skill used by the contractor in detailing and finishing the thermal envelope has a lasting impact on the operational efficiency of the building. Waste generated on site is a larger impact and all efforts should be directed towards limiting waste sent to landfill to an absolute minimum by employing strategies to ensure waste is firstly eliminated by design and specification co-ordination or ensuring a recipient is found either through a waste handler who can repackage or recycle the material for other uses or return to the supplier for reprocessing (BERR , 2008).

### **Sustainable Operation**

Good well informed facilities management is critical to excellent building performance, post occupancy evaluation carried out regularly is vital, monitoring of services is necessary to ensure the building is operating as it was designed to and occupant surveying will help to establish comfort levels. There will be a limit to the successive energy savings an occupant can make over the design life of a building through careful management alone and there will be a need for additional investment from time to time. Maintenance and cleaning are vital to ensure a building continues to perform well.

### **Sustainable Deconstruction**

The end of life of any building should be extended to minimize environmental impact. If the expectation for the functional need for a building is short, a strategy should be in place from inception to identify or optimise secondary uses. If this is not possible then a well defined strategy for deconstruction should be established and communicated to building users and owners to facilitate deconstruction (Morgan and Stevenson, 2005; Addis and Schouten, 2004). Demolition should be replaced by Eco-deconstruction. The current practice of demolishing buildings is environmentally unacceptable and is not without its costs to the community as it is a practice based on speed and minimum cost resulting all materials ending up in landfill with few employment opportunities. There is a need for research and development to offer innovative solutions for design for disassembly and eco-deconstruction.

### **Traditional Role of Quantity Surveying**

The major competencies of the Quantity Surveying profession are the quantification of buildings materials required for a construction projects with the management of the associated cost, that is, cost management (Tay, 2015). Also, the Quantity Surveyors are also expected to prepare the contract documents and partake in assessment of claims in relation to the contract, that is, contract management.

Traditional Quantity Surveying practices in relation to the buildings delivery process include the following, though not in the order of importance:

- Feasibility studies
- Measurements
- Cost planning and Estimating
- Construction financial controlling
- Preparation of BoQ and tender documents
- Preparing financial statement
- Preparation of payment assessments and invoices
- Assessment of variations
- Cost control
- Value engineering

According to Willis's and Practice and Procedure for the Quantity Surveyor (Ashworth & Hogg, 2007) the role of the Quantity Surveying has been defined by Royal Institution of Chartered Surveyors (RICS, 1971) as "ensuring that the resources of the construction industry are utilized to best advantage of society by providing, inter alia, financial management for projects and a cost consultancy service to the client and designer during the whole construction process." However, the roles of the Quantity Surveying profession within the contemporary built environment will be discussed as follows:

### **Preliminary Cost Advice**

One of the quantity surveyor roles is to ensure that the proposed project is carefully constructed, in terms of costs arising throughout entire design and construction process.

Quantity Surveyor also acts to suggest his professional and reliable advices to his client on matter of cost at various stages during the design and construction process. However, the advices given during inception stage are vital important as the decisions taken in this stage will seriously affect the quality of works to be carried out. Quantity Surveyor will offer cost advice for the comparative design solutions of the alternative materials to be used or the form of construction to the adopted." Quantity surveyor is the recognized professional cost and value consultant, their measurement and valuation knowledge are without equal (Ashworth & Hogg, 2007).

### **Cost Planning**

The cost planning process commences with the preparation of an approximate estimate and then the setting of cost targets for each element. As the design evolves, these cost targets are checked against the developing design and details for any changes in their financial allocations." Quantity surveying profession under this aspect will require the Quantity Surveyor to allocate the approximate estimated costs into subdivisions, known as elements within a building. Ashworth and Hogg (2007) stated that "These element costs can be compared against the element costs of other similar projects from the Quantity Surveyor's cost library records." The purpose is to provide a better value of money for client. It also keeps the designer fully informed of all the cost implications of the design. Quantity surveyor might also try to reduce the estimated costs by simplifying the details without modifying the design. Besides contract document will also be prepared on this basic to make the preparation of cost analysis easier. Cost planning will be developed and while taking account of appearance, quality and utility, the cost is planned to be within the economic boundary (Willis, Ashworth & Willis, 1994).

### **Procurement and Tendering Procedures**

It is important that Quantity Surveying profession to be applied during this stage. Quantity surveying profession in this aspect will include as follows:

- Recommending an organizational structure for the proposed development of a project
- Advising on the appointment of the various consultants and contractors in the knowledge of the information provided by the employer
- Managing the information and coordinating the work of the different parties
- Selecting the methods for the appointment of consultants and contractors
- Determining the employer's requirement in terms of time, cost and quality
- Assessing the viability of the project and providing advice in respect of funding and taxation advantages
- Quantity Surveyor plays a crucial role to provide appropriate advices on the method of procurement to be used for clients who wish to undertake construction work

There are various procurement methods to deal with the different demand and various situations; client should not select an inappropriate form of procurement unwittingly. Quantity Surveyors are in an excellent

position as procurement managers with their specialist knowledge of constructions and contractual procedures. They are able to appraise the characteristic of the competing methods that might be appropriate and to match these with the particular needs and aspirations of the employer.” Hence, clients are advised to seek for Quantity Surveyor for relevant and reliable advices or recommendation when making their decisions. Due to this, advices and recommendation provided by quantity surveyor must be independently without the intrusion of individual bias and self-interest (Ashworth & Hogg, 2007).

### **Contract Documentation**

When the choice of the form of contract has been decided, the next step is the preparation of the documents that will accompany the signed form of contract. The contract documents for any construction will normally include the following information:

#### **Contract Drawing**

It includes plans, elevation and cross section. Some other additional details will also be prepared based on the complexity of the project. This will provide information for the client to get the idea of architect’s engineer design intention. The contract drawings are normally provided by architect and engineer. However, the role of Quantity Surveyor is to collect the drawings and any specifications from the architect and at the same time discuss the job. There is however some more detailed questions will arise; therefore a timetable for the completion of the contract bills will be agreed, along with dates when additional detailed information and drawings can be expected.

#### **Contract Bills**

Quantity Surveyor will involve in preparation of contract bills. “The appointment of the Quantity Surveyor is likely to have been made at early stage when early price estimates were under consideration. This may be before any drawings are available, in order to provide some cost advice to the client.” Due to this, Quantity Surveyor will normally be needed except for on a very small project, the demand for the profession of Quantity Surveyor might only to be eliminated. Besides, there is a condition to provide approximate quantities depending upon the completeness of the drawings and other information from which it was prepared contractors.

#### **Articles of Agreement**

This is the part of the contract which the parties sign. The contract is between the employer (building owner) and the contractor (building contractor). The blank spaces in the articles are filled in with the (i) Names of Employer, Contractor, Architect and Quantity Surveyor, (ii) Date of the signing of the contract; (iii) Location and Nature of the work, (iv) List of the contract drawings; (v) Amount of the Contract Sum.”

#### **Condition of Contract**

The condition of contract includes the contractor’s obligation to carry out the work shown on the drawings and described in the bills to the satisfaction of the architect. They cover the matter of quality of work, cost time, nominated supplies’ and subcontractor’s insurances, fluctuation and VAT.

### **Role of Quantity Surveyor s in Sustainable Built Environment**

Ma & Luu (2013) highlighted the changing roles of Quantity Surveyors in order to ensure a sustainable built environment as follows:

- (i) Sustainability strategy development
- (ii) Life cycle cost appraisal
- (iii) Advising on engineering services solutions
- (iv) Valuing sustainability of a property
- (v) Selecting the most cost effective option for a sustainable design.

Similarly, Peah (2009) identified the role of Quantity Surveying in sustainable built environment as follows:

- (i) Life cycle costing
- (ii) Property Performance Reporting
- (iii) Building Rating Assessment
- (iv) Building Information Model

### **Challenges faced by Quantity Surveying in Sustaining a Built Environment**

The Quantity Surveyors role is fundamental in sustaining a built environment through implementing sustainability in a built is not without its challenges. These challenges therefore call for the need for the Quantity Surveyors to redouble their efforts in the way and manner they function. Some of the challenges are the following:

- (i) Little awareness in social responsibility
- (ii) Little awareness in sustainable construction
- (iii) Cost of attending courses, seminars, conferences and workshops to broaden Quantity Surveyors horizon on sustainability of a built environment

- (iv) Lack of sufficient database on sustainable built environment.

### **III. RECOMMENDATIONS**

The following recommendations were made that Quantity Surveyors should:

- (i) Upgrade themselves with relevant skills and knowledge in sustainable development
- (ii) Attend seminars and workshops on sustainable built environment
- (iii) Build up cost database on sustainable buildings
- (iv) Work together in synergy with other professionals in building industry and the environmentalists

### **IV. CONCLUSION**

In summary, a competent Quantity Surveying in order to play his role effectively in sustainability of a built environment must be able to:-

- i. Understand the concept of sustainability
- ii. Keep abreast of the alternative building materials so as to give good advice on the cost of construction and propose a suitable method or building material for the purpose of achieving a sustainable built environment.
- iii. Progressively develop their skills and knowledge so as to remain sustainable in the profession.

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