Developing Sustainable University Campus Index

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Abstract

Tertiary education is central to economic and political development and it is a powerful potential for growth which is very vital in an increasingly globalizing society. Universities play very important roles in the development of tertiary education and the society. It is probably in view of this fact, that the state of universities generally, is attracting global attention and the universities are currently ranked in order of performances. Although human development and economic growth depend largely on the environmental setting, however, the existing ranking system fail to consider environmental issues, despite current trend in green campus movement and sustainable development of universities. It is in the light of this, that this paper considers the prospects of developing a sustainable development rating system as an addendum to the method of ranking university campuses. Existing tools of measuring sustainable development in buildings were reviewed and BREEAM was considered most suitable for the development of university Campus Sustainable Index (CSI). It is also believed that the rating system will not only create environmental awareness and stimulate competition among universities but effect improvement in environmental conditions and environmental management systems of university campuses as well as provide a melting point of understanding sustainable development in university campus.

Keywords: Tertiary Education; Sustainable Campus Index; University Campus; Environmental Management

INTRODUCTION

Universities world wide are attracting global attention. This is not unconnected with their role of providing tertiary education which is essential for the enhancement of social, economic and political development. Today, the university can be seen as the generator for human advancement through manpower development and technological innovation.
In the light of this, universities have become very important sources of foreign revenue generation through the provision of local and cross-border education services (Bashir, 2007) - a phenomenon which is stimulating competition in an attempt to woo more student.

Also the believe that university education is the key to modern life, amidst unemployment and low income of unskilled labor have increased the demand for university admission and the need for expansion of the sector. This has resulted in unprecedented growth in size of university campuses, with corresponding negative environmental impacts due to unsustainable practices and poor environmental management.

In view of this, the paper aim to suggest a set of criteria or sustainability campus index SCI applicable to university campuses and which can be used to test and measure sustainability levels of university campuses.

Although this paper may not be directly applicable to institutions without established Campuses, which therefore have no master plans, it addressed environmental issues in university campuses and believes that Building Research Establishment Environmental Assessment Measures (BREEAM) could be suitable for the development of the sustainable campus index SCI.

Tertiary Education and global development

Tertiary education is a powerful potential for growth, and it is central to economic and political development and also play critical role in capacity building and professional training (Materu, 2007). Tertiary education offered by the university has become very vital "in an increasingly globalizing knowledge society", therefore universities within which tertiary education are provided have become important tools for global development.

It is usual to find universities in an enclosure referred to as the campus. The campus is traditionally the land on which a college or university and related institutional buildings are situated. These may include libraries, lecture halls, residence halls and park-like settings.

Although, the roles of the University in the society remain very important, some authors believe that the structure of the contemporary University is changing rapidly. For instance, Readings (1997) claimed that historically the integrity of the modern University was linked to the nation-state, but universities today are increasingly turning into transnational corporations, and the idea of nation-culture is being replaced by the discourse of "excellence. He further stated that the new University of Excellence is a corporation driven by market forces, and, as such, is more interested in profit margins than in thought.

Higher education today has become a tradable service (Bashir, 2007) in view of departure from the traditional collaboration and international education exchange, which included partnership in research and provision of scholarships for foreign study. Consequently, tertiary education services are globally characterized by the cross- border consumption. Although not all cross national higher education constitutes trade, it is desirable that those who consume higher education provided by foreign supplier and those who provide higher education to foreign suppliers should benefit symbiotically from greater exchange. However, this is not usually the case as most foreign providers are neither regulated by authorities at home nor that of the host countries. Therefore, students often lack information on the quality of foreign providers and are vulnerable to aggressive marketing campaigns. Fortunately, the world university ranking attempts to fill this gap, however, the ranking system is not without its own inadequacies.

Although some university operators are in favor of the non-residential and virtual universities, and digital classrooms, others propose green campus designs, pedestrian and/or sustainable campuses, and many others are moving towards rediscovering past glories of their university campuses through strategic planning and physical development (Olson, 2007).

Recent studies view tertiary education as international trade on a scale similar to telecommunication and financial services with movements of students to study in foreign universities (Bashir, 2007), as well as human capital and knowledge as sources of economic growth and capacity development. Furthermore, innovation in the education sector encouraged movement towards virtual university, digital /cyber lecture and classrooms and non- residential university campuses among others. It is now possible to obtain University degrees from the confinements of corporate offices and supermarkets, hence, making the traditional university campus unnecessary and less important.

Consequently, it becomes doubtful whether the contemporary university is performing adequately its traditional social function and environmental expectations. However, it is evident that a new age is dawning for the University and the society is yet to understand what precisely the changes in the university culture will mean to tertiary education in general (Readings, 1997). While it may not be easier to determine the correlation between university campuses and academic performances, the pursuit of university education alongside other duties and outside the confinements of a university campus is a change in status of tertiary education that is attracting concerns among stakeholders about the standards of present day university.

University Campus Environment

The environment of university campus is very significant to academic pursuits and tertiary education in a similar manner that hotels are significant to business and tourism. The point is not whether; business or tourism can not survive outside hotels and hospitality facilities, in a similar manner that university degrees can be obtained without the campus. However, the setting within which the university operates may psychologically influence the performance and standard. Consequently, in order to achieve qualitative academic setting, the standard of the living and learning environment must be qualitative, desirable and sustainable.

Therefore, the quality of university environment and the facilities available within the campus may determine the quality of services provided and these play important roles in the way such environment is perceived. This is because comfort, convenience and accessibility to facilities, are among the psychological requirements to promote growth in most social and economic ventures, of which the university is not an exception. Although, facilities, amenities and infrastructure are usually organized within university campuses based on master plans duly prepared for such purposes, but the concern is how sustainable?

Not withstanding divergent thoughts and changes, contemporary university campus is regarded by many as small cities in view of their large physical and demographic sizes.

Similarly, the university is compared to complex buildings like hospitals, and mega hotels in terms of waste generation, water and material intake as well as electricity and hydrocarbon fuels consumption in operating machines and transportation, having serious implication on environmental quality. In fact, the various and complex activities taking place in campuses have serious direct and indirect impacts on the environment (Alshuwaikhat & Abubakar, 2008). Furthermore, unsustainable demand for land and water among others resulting from rapid growth of university population and expansion of campus, increases degradation of the university ecosystems and erode life supporting system that upholds human civilization. (Alshuwaikhat & Abubakar, 2008) Therefore, revealing the academic institutions as integral part of the automobile intensive, high-consumption, waste- intensive global landscape.

In view of these, environmental protection agencies now hold colleges and universities to the same standards as industry with regards to issues of human health and environment, as a result of the significant environmental impact of various activities and operations of the university, (U.S Environmental Protection Agency, 2000). Hence, the need to respond appropriately to the challenge of finding balance between human quest for economic and technological development as well as environmental preservation within the university campus, made campus sustainability an issue of global concern.

Current trends in environmental concerns have been emphasizing sustainability in the university campuses. Some of these are directed towards campus environmental planning (White, 2003) as means of managing university campus ecology. Emphasis on environmental sustainability in most developments is in response to the world commission for environment and planning 1987.

Sustainability is concerned with issues of social, economic and the environment and affects all aspects of human development and economic growth. However, in view of the broad nature of each aspect and the interrelationship that exists between and within each factor, this paper will concentrate on the environmental sustainability of the university campus with the objective of influencing the other aspects since all the factors are interrelated.

Environment is the setting within which all activities thrive; and the nature of the environment affects the performance of other activities. Therefore, the academic activities of the university campus require serene and healthful environment where movement is comfortable and accessibility to facilities are easier and convenient. In order to attain efficient and functional university campus, a study of sustainable development of the university environment becomes paramount.

It is in view of the realization of these that college campuses especially across the United States are experiencing a rebirth of sorts. With rising student populations, demand for state-of-the-art educational facilities and the desire to recruit the best prospective students, college campuses are undergoing a renaissance - reassessing buildings and razing, rebuilding or renovating them. For instance, at the University of Wisconsin - Whitewater, a walk through the campus demonstrates the renaissance is alive and well as

the university undergoes a variety of projects that will offer the students of the 21st century a 21st century education (Olson, 2007). Furthermore, it should be realized that all physical assets have a termed life, including buildings. Although, strategic planning and physical development may enable university campuses to adapt and install facilities to support changes in educational programs and education delivery (Olson, 2007), sustainable campus index SCI will ensure movement in the right direction.

Trends in University Campus Sustainability

University campus here refers to an institutional space designed for living and learning purpose. University campuses have changed so much in recent times; some have grown large in physical sizes and demography so much so that they can be regarded as small settlements. Also the impacts of various activities within the campus have direct and indirect impacts on the environment, some of which compares to Mega hotels or large hospitals. These and other factors have led to the university campus to be viewed and assessed in the same capacity with industries by some Environmental Protection Agencies (Alshuwaikat, 2008).

In view of the importance of higher education to human development and economic growth, there is the need to curtail negative environmental impact of university and make the campuses more sustainable; however, the absence of consensus and universal direction regarding university campus development presents a confusing scenario. Current trends in university campus development are as diversified as the understanding of the term 'sustainability' among actors and the methodology of managing the sector varies.

Many researches show concern on environmental issues like sustainable transportation in the university communities (Balsa 2002; Toor& Spenser, 2004; Dorsey 2005)). Similarly, contemporary discourse are found among campus facilities in areas of virtual libraries as universities are described today as learning cafes (Morell Boone, 2004, 2006), as well as in waste management programs (Mason, 2008), while recent trends include innovations the green design movement as an approach to solving campus environmental problems. The green campus movement is becoming more popular and very comprehensive. For instance issues discussed in this area include GIS-based evaluation of greenery, greening campus restaurant (Nilsson, 1988).

It is true that the issues being discussed are related to university campus sustainability and are important to the environment and certainly aim to promote the world environmental Agenda of 1987. However, despite many environmental protection measures in some universities, a more systematic and sustainable approach to reducing negative impact is generally lacking (Alshuwaikhat, 2008), this is because the concept of sustainability presents diverging interpretations (Lourdel, *et al*., 2005) among the actors and operators that practice sustainability in university campuses.

In view of the above, little attempt is made on the development of sustainability indices with which campus sustainability could be measured. Therefore there is the need to develop an index based on common criteria among university campuses. A movement in

this direction will not only facilitate uniformity in the perception of sustainability, but also offer a universal method of rating campuses as well as serve as design guide for the planning and development of university campuses.

Although, the sustainable campus index (SCI) can be used for ranking university campuses according to their sustainability levels. It is not intended to substitute the existing ranking system with SCI; however it may serve as addendum to the existing method and provide a melting point of conception and ease the understanding of sustainable development. Furthermore, SCI may stimulate competition in environmental matters as well as encourage improvement in environmental management system among universities. This movement may be desirable in view of the global climate change and the need to preserve global ecology.

Concept of Sustainable Development

Sustainable development has been variously defined. Generally, it is a change in which societies improve their quality of life, reaching dynamic equilibrium between the economic and social aspects, while protecting, caring for and improving the natural environment (Lozano, 2006). With reference to university campus, Sustainable development is the biggest challenges of the twenty first century (Weenen, 2000). However, it can be regarded as a process where the negative environmental impacts of activities in the campus are reduced or mitigated without jeopardizing current pace of development as well as preserving the ecosystem for future generation while promoting positive environmental practices aimed at impact on local, regional and global environment.

The term "sustainable development" is a prophetic combination of two words which unites both aspects—economic progress and environmental quality (Renn *et al*. 1998). The concept of sustainable development was originally introduced as a microeconomic concept in forestry meaning a strategy aimed at providing wood without wiping out the forest. Since the mid-1980s, however, the term has been used to describe a wide range of attempts to correlate economic development with the maintenance of ecological capacity and values.

Sustainable development has been world famous since the Brundtland Commission publication in 1987. At the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, the concept of sustainable development played a central organizing role. The recommendations for sustainable development were collected and published as "Agenda 21" (Renn *et al*. 1998). Although, Sustainable development and its principles have been adopted by some higher education institutions, many universities are still unaware of it or confuse it with environmental sustainability (Lozano, 2006). A large percentage of university leaders and faculty members are also unable to effectively and efficiently incorporate Sustainable development into the university's policies, and fail to ensure that Sustainable development becomes an integral part of the university culture so as to create a multiplier effect within the institution and in society, in the short and long-term.

Although, the concept of sustainable development has been variously defined and interpreted, many perceive it solely from environmental point of view, although others disagree with this view since the three key aspects of sustainable development i.e. economic, environmental and social issues are parts of everyday life. Some schools of thought further argue that the integration and equilibrium among these three aspects must be taught and transferred from this generation to the next and the next (Lozano, 2006).

However, the popularity of the term is no guarantee that it is useful because understanding of the integration and equilibrium is not an easy task in view of the variables involved and the unstable nature of the term "sustainability". Although the widespread thought, discussion, and the organization of activities around the theme of sustainable development does reflect widely shared concerns about how human and environmental welfare can be maintained and improved, many have argue that its broad acceptability is evidence of lack of specific meaning (Renn *et al*. 1998).

In addition to United Nations, the term sustainability became popular among many national and international organizations including the World Bank, ecological research institutes, and corporate groups. Furthermore, entire new research institutes have been set up throughout the world with "sustainability" as their field of concentration. It is in view of this popularity, sustainability continue to have different meanings to different people. Therefore, it is necessary to define the concept of sustainable development much more clearly in terms of its true controlling parameters if it is to be a useful concept for global development (Glasby, 1995). It is the objective of this paper to discuss a set of criteria that could be acceptable to all stakeholders, which has clear controlling parameters with which the levels of sustainability of university campuses could be determined.

Importance of Sustainable Campus Index and its Application

The importance of sustainable campus index may not be unconnected to the fact that University education is very crucial to global development. This is partly because the tertiary education sector support research and it is responsible for sustaining the machinery upon which majority of the global skilled manpower for human development and economic growth depends. This probably explains the global interest in the standards and performances of universities world wide.

Today, the Universities are ranked according to their ability to meet certain standards and criteria. These criteria are none the less based on factors outside the environment upon which the universities are established; therefore they are in majority non-spatial values. Notwithstanding, ranking of universities has produced appreciable level of competition among higher institutions globally, whereby most strive to maintain or improve their positions based on the ranking criteria. Similar effect could be obtained by ranking the universities' campus sustainability through the sustainable campus index (SCI).

In view of global climatic changes, and current trend and interest on sustainable development, SCI may serve as a means of managing and sustaining the university campus environment for present and future generation. The environmental dimension

proposed by this research may be beneficial to ranking of university campuses, create competition as well as contribute towards improving the global environmental conditions. For instance, the problems of size, pollution, landuse, ecology and transportation in some university campuses as well as the corresponding environmental impacts are similar in scale to small cities. (Alshuwaikhat, 2008; Balsas, 2002; Lozano, 2006).

Furthermore, the university communities are very distinct (Balsas, 2002), they are places where people of different backgrounds, incomes, lifestyles and attitudes do come together to live, study, work and recreate. The campus societies are both transitory and lasting in many ways. Although traditionally, campuses are self contained and variety of functions are concentrated within reach of pedestrians, they impact on neighboring communities in terms of traffic and parking, service access and off-campus housing. Therefore, aggregate universities which occupy a substantial percentage of the global surface, and the activities within the campus have varying implications on local and global environmental conditions.

To further justify the need for SCI, Alshuwaikhat, (2008) opined that varying approaches to addressing environmental issues have become inefficient and can not guarantee sustainability. This is because sustainability involves many issues. Environmental issues are becoming more complex, sustainability is multidimensional and interconnected. However, environmental sustainability requires integrated and systematic approach to decision making, investment, and management. Consequently, while some environmental protection regulations focus on control of water and air emission as well as waste disposal, others such as BREEAM considers about nine (9) areas (Fig. 1). Therefore there is the need for a professional and systematic environmental management approach to:

a) reduce the consumption of resources
b) reduce negative impact of various campus operations, and
c) promoting campus sustainability

Unfortunately, these approaches are lacking in most universities and achieving sustainability is not easy. Although some authors have proposed a more suitable integrated approach to achieving campus sustainability as an attempt to remedy the limitations of current environmental management practices in universities. This was proposed through the integration of 3 strategies, namely;

a) University EMAS – environmental management systems
b) Public participation & social responsibility and
c) Promoting sustainability in teaching and research

This paper proposes CSI (Campus Sustainability Index) as a tool to measure the sustainability variables within the university campus. This is based on common criteria affecting sustainability in university campus. Some of which include classrooms, laboratories, housing, transportation, water, energy, pollution, waste management, landuse and ecology as well as environmental management system among others.

The index here is developed based on known sustainable development tools such as BREEAM, Green Globes and, LEEDS among others. The index will use rating tool to

measure the various aspects of the university where the final score will be a percentage of the SD level of the university and these can be used to rank various university campuses.

Existing Method of Academic Ranking

The two famous sources of academic world ranking of universities are the Times Higher Education Supplement (THES) and the Shanghai Jiao Tong University academic ranking systems. These have been criticized as faulty as there are doubts about the usefulness of the tables they produced (Lipsett, 2007). Based on the findings of researchers that studied the THES's 2006 world university rankings and the Shanghai Jiao Tong University, the academic ranking of world universities table is misleading and should be abandoned.

There appear differences between both rankings so much so that four (4) of the top fifty (50) in the Shanghai list did not even appear in the first 500 universities in the THES ranking. This discrepancy is associated to 'poor methodology and inappropriate indicators' making the ranking systems invalid. For instance, while the Shanghai system measured research excellence partly by number of Nobel and Fields winning alumni at the institution, the THES ranking placed emphasis on the results of a survey of more than 190,000 researchers who listed what they thought are the top 30 universities in their field of research.

Consequently, the Shanghai system failed to guarantee good undergraduate education but reveals the institution's prowess at prestigious awardees, while the THES ranking is based on opinions which may contain significant bias.

There is a call for global collaboration to standardize data on key aspects of universities and other institutions, believing that evaluation exercises should not force spurious averages and oversimplified rankings. The present ranking methods have been criticized as been ridiculous and that institutions should be judged based on objective and sensibly criteria. The criteria of the THES show dramatic rises and falls and professionals believe that THES ranking are 'simply not credible. At a conference held in Holland earlier 2007, enormous methodological inadequacies of the university rankings were exposed.

One of these was ranking the universities as a whole by assuming that the faculties within are equal. Also there is inherent bias in favor of English – speaking universities and against smaller specialized higher education institutions. Many authors submitted that there is no sign that a high – ranking university on the table is better that one more lowly ranked.

A modern college or university tends to be an incredibly diverse and multifaceted group of people, activities, and goals. In spite of the basic instructions taking place, there are also research, athletics, extracurricular activities, community interaction, artistic performance, socializing, and many other activities as well as many other factors like its faculty, its financial strength, its name recognition, the success of its graduates, the quality of its incoming students, its ability to succeed with marginal students, its physical facility, the surrounding community, and so on distinguished one institution from its peers. Therefore, it can certainly be argued that it is simply impossible to reduce all of

these factors to a single, mono-dimensional ranking that says "College A is better than College B."

Rankings can be a negative influence when students or parents look more at how highly a school is ranked instead of how well it will serve the needs of particular student. It is universally agreed among College admissions counselors that a school must be satisfactory to the students' requirements in terms of academic and social environment, athletic and other extracurricular opportunities, as well as urban or rural location, etc. A good choice will result in a great college experience and, most importantly, maximum personal growth and achievement.

In view of the inadequacies of the existing ranking system, the proposed CSI may assist by introducing of spatial dimensions to university rankings; this may be of immense benefit to university campus development, bearing in mind the state of our environment in recent times and the roles and implication of the university campus activities on the global environment

Other advantages of the sustainable campus index SCI are:

a) SCI would provide the melting point for the divergent approaches to sustainable development and management in universities and serve as the fulcrum for university campus management which in turn will promote sound environment that may have spill over effect on regions and local and global situation
b) Encourage the promotion of environmental management concern among universities worldwide.
c) Adoption of spatial and environmental condition as important additional criteria to consider in measuring and ranking global universities.

The believe that universities worldwide constitute an aggregate percentage of global landuse, its sustainability would influence not only the universities but may spill on to the surrounding local environment and the region in general.
There is the need for consensus opinion about university campus development and sustainability.

Sustainable Development Tools of Measurement

Below are existing tools of measurement adapted in some countries to measure sustainability and compliance with green design codes.

i. BREEAM – Building Research Establishment Environmental Assessment Measures (Britain)
ii. SB Tool (Canada)- sustainable building tools
iii. LEED (US) - Leadership in Energy and Environmental Design (US)
iv. Taiwan - Sustainable Building Index
v. EIQ – Hong Kong
vi. CASBEE – Japan
vii. Green Globes (USA)

viii. Green Star (Australia)
ix. Green Mark (Singapore)
x. others include sustainable development record and sustainable development ratio (Sweden)

Although, the majority of the above tools are standards applicable mainly to buildings, some have recently been modified for neighborhood sustainability (e.g. LEED neighborhood). Most consider issues that borders on buildings and site development, energy sustainability and energy consumption, environmental indoor quality, Energy efficiency /CO_2, Water efficiency, Surface water management, Site Waste Management, Household Waste Management, Use of Materials Lifetime homes (among other issues). However, this paper reviews only three considered to have prospects for university campus sustainability and can be developed as sustainable campus index SCI. These are Green Globes, LEED and BREEAM.

The Green Globes is an environmental assessment, education and rating system promoted in the United States by the Green Building Initiative – a non-profit organization. It is internationally recognized and has been used in Canada by the federal government for some years now. Green Globes suite of tools has been the basis for the Building Owners and Manufacturer's Association (BOMA) of Canada's Go Green Plus program. Green globe system is an online interactive tool which competes favorably with the more cumbersome and more expensive Leadership in Energy and Environmental Design (LEED) system of the U.S. Green Building Council another non-profit organization based in Washington, DC. LEED is a Green Building Rating System, developed by the U.S. Green Building Council (USGBC), provides a suite of standards for environmentally sustainable construction.

Green Globes is helpful both in new construction of commercial buildings and also the maintenance and improvement of existing buildings. When compared the two systems are very closely associated. It was observed that about 80 percent of the categories available for points in Green Globes are also addressed in LEED and that over 85 percent of the categories specified in LEED are addressed in Green Globes. Although, there was moderate dissimilarity between the rating standards, LEED has a slightly greater emphasis on materials choices while Green Globes has a slightly greater emphasis on saving energy. The LEED considers six (6) issues such as: Sustainable sites, Water efficiency, Energy and atmosphere, Materials and resources, Indoor environmental quality, Innovation and design process.

Many buildings evaluated with both systems have generated comparable ratings; although very few of the buildings were only marginally different. The primary differences between the two approaches then boil down to ease of use and cost. Green Globes seem to have simpler methodology, employing a user-friendly interactive guide for assessing and integrating green design principles for buildings, in contrast to LEED's more complex, and largely paper-based system. Although LEED has recently introduced an online-based system, it remains more extensive and requires expert knowledge in various areas. Green Globes' web-based self-assessment tool can be completed by any

team member with general knowledge of the building's parameters. However, LEED tends to be more rigid, time-intensive, and expensive to administer.

Finally, the third tool to be considered in this paper is known as BREEAM. This assessment method considers issues under nine (9) categories or criteria. These are Management, Energy, Water, Landuse and Ecology, Health and Wellbeing Transport, Materials Waste and Pollution. This method appears to be a combination of the two earlier methods and it is more comprehensive.

BREEAM's method of scoring and environmental weighting system is easier and the weighting system of the nine (9) issues being measured are clearer and more comprehensive as shown in Figure 2. Therefore, BREEAM method of assessment of sustainability appears to be more suitable in view of the issues considered.

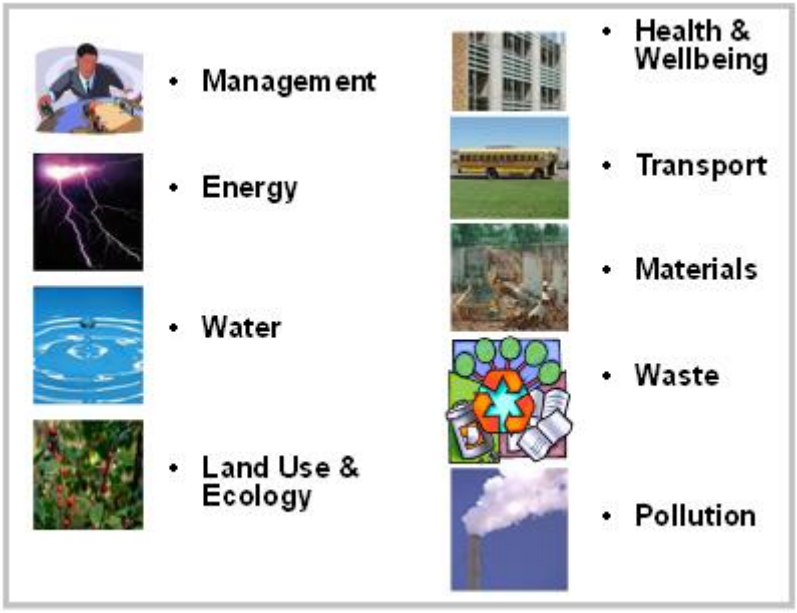

Figure 1: Issues and Categories of BREEAM Assessment Method

Preferred Sustainable Campus Index

Many models of university campus sustainability use varying elements to explain the path to achieve the global warming potentials of the university campus. Energy is central to sustainability because energy connects everything to everything else more universally and more quantifiably than any element. Similarly energy is the most highly rated factors among the issues considered by all the assessment methods reviewed, and energy is the most important factor of sustainability (Abdul-Azeez, 2015). This is because energy affects all other factors and is also very significant to global environmental sustainability in view of global warming.

Global warming is attributed to carbon dioxide CO_2 emission from two major indices of energy, namely Transport and Electricity. It will suffice therefore to infer that Sustainable

Campus Index (SCI) is an index of measure for carbon emission from all energy use within the university.

Table 2: BREEAM Categories of Environmental Weightings
Source: (Modified after Gallagher, A. 2015)

BREEAM Category	Weightings
Management	12.5%
Health and well being	14.5%
Energy	19.5%
Transport	8%
Water	6%
Materials	13%
Waste	5%
Land Use and Ecology	10.5%
Pollution	9.5%
Total	100%
Innovation	+10%

Therefore, Sustainable Campus Index (SCI) is equivalent to CO_2 emission (Etotal) from total energy consumption to support operations of activities for campus population and the built up space within the university (see equation 1). Where;

$$E_{total} = E_{electric} + E_{transport} \quad \textbf{(1)}$$

$E_{electric}$ = CO_2 emission for energy use for lighting, cooling / space comfort and operation of appliances for Teaching and Learning Sector as well as in all buildings and also for Information & Communication Technology.

$E_{transport}$ = CO_2 emission for Transport Energy use for University Vehicle Fleet, movement of Commuting Staff and Students and for movement of other goods and services.

CONCLUSION

Measurement of sustainability level is not an unusual practice. However, the concept of sustainable development needs to be much more clearly defined in terms of its true controlling parameters if it is to be a useful concept for global development.
This paper believes that the criteria considered in BREEAM is most appropriate and more applicable to most universities, the Preferred Sustainable Campus Index (SCI) will be more suitable to measure the sustainability levels of university campuses generally.

Finally, it must be understood that SCI is not intended to replace the existing world ranking system of universities, which is purely an academic criteria. However it is hoped that SCI as an environmental criteria should stimulate similar competition among universities and create a total environment that is functional and sustainable as well as ideal for living, learning and recreation.

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