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Green Universities from a Sudanese Perspective
University of Khartoum (U. of K.) - A Pioneer Green University

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Review Article

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Abstract

During the 1990s of the last century, Sudan witnessed the establishment of a large number of state Universities, as well as, private institutes and faculties. Nevertheless most of these institutions suffer a lot from constraints and difficulties that prevent them from being green universities. However, Sudanese universities which developed at earlier time can be considered as green ones.

This paper focuses on the University of Khartoum, which was initiated in the year 1904 as a good example for such type of green institutes. It is green because of the following facts: unique location at the left bank of the Blue Nile River, occupies a large surface area, well developed infrastructure, well built environment, presence of large green open spaces and a large number of trees that are present whenever you go in the university, as well as, there is a shelter belt of ever green trees surrounding the outer walls of the university, buildings of theaters, lecture rooms, laboratories, staff and administration offices are well aerated and need less energy for cooling due to that fact that the walls of all buildings are hollow that allow the circulation of air inside these walls, and students cafeteria and café and other students activities are located in areas away from the faculties buildings in addition to the presence of two football yards etc. Moreover, the staffs of this university are of a high caliber and the students who join it are of high quality and are tops of the students of the whole country. One can conclude that regardless of the financial difficulties and political instability facing the University of Khartoum, this university is considered as a green university with green education facilities and opportunities and strong infrastructure which is more friendly with the environment, and those who graduate it are now leading development not only inside the country but also in other countries. One can conclude that the University of Khartoum is a pioneer green University since its establishment at the beginning of the 20th century.

Keywords: Green Building; Green University; U. Of K; Resource Savings

Introduction

"Green building" is a phrase that's used a lot, but often not explained. The terms "green" and "green building "apply not just to products, but to construction strategies, building design and orientation, landscaping, building operations, maintenance, and more. The less impact a building has on human health and the environment the more green it is.

Paper Objective

This paper explores or highlights a new vision for green universities from a Sudanese perspective in addition to the traditional concepts.

The Concept of "Green Building"

Green building is a whole-systems approach to the design, construction and operation of buildings-from the early stages of development through the final finishes. This approach benefits building industry professionals, residents and communities by improving construction quality, increasing building longevity, reducing utility and maintenance costs, and enhancing comfort and livability. There's nothing mysterious about green building-it's really just applied commonsense [1-4]. To move forward with greening your construction project, it is helpful to think of green building as the convergence of three fundamental objectives:

1. Conserve natural resources
2. Increase energy efficiency
3. Improve indoor air quality

Natural Resources Conservations

Conventional building construction and operation needlessly consume large quantities of wood, water, metal, fuel and other natural resources. Wood, for example, is one of the most common building materials, but it is often used wastefully. In fact, there are a great variety of effective building strategies that conserve natural resources, as well as providing benefits such as cost savings. One approach is to avoid using unnecessary materials, such as by allowing structural elements like concrete floors to serve as finish materials. Other strategies include using durable products to reduce waste and specifying recycled-content products that reuse natural resources.

Energy Efficiency

Energy efficiency is the cornerstone of any green building project. Improving energy efficiency and using renewable energy sources are effective ways to reduce the potential energy supply interruptions, improve air quality and reduce the impacts of global warming.

Energy efficiency also makes economic sense for building owners and residents: an energy efficient building saves money by reducing utility bills year after year.

Indoor Air Quality

Poor indoor air quality is often caused by mold and mildew that build up as a result of moisture infiltration or poorly designed and maintained heating and cooling systems. Dust, another major source of indoor air pollution, can be reduced by using track-off, floor mats at entryways, and by using easily cleanable flooring materials such as natural linoleum, wood or wood alternatives, or concrete. Another common source of indoor air pollution is the off gassing of chemicals found in many building materials. Pressed wood products such as particleboard and plywood paneling, for example, are typically held together by adhesives that release formaldehyde-a probable human carcinogen-into the home for years after installation. Many paints, floor finishes, adhesives and sealants also emit unhealthy volatile organic compounds (VOCs). Fortunately, the building products industry is responding to these indoor air pollution problems by developing safer products, including alternative glues in pressed-wood products, and low- VOC paint, finish and adhesive products. Poorly managed timber harvesting practices can damage ecosystems and harm the long-term economic well-being of local communities. Connections to the Natural and Built Environment Fundamental to green design are the relationship between a building and the environment-both the natural and the built environment. While affordable housing projects typically have more site constraints than market-rate housing, every site presents unique opportunities. The design team should carefully assess the site's natural elements-including solar access, wind conditions and existing plant and animal life-and strive to design in harmony with those elements to reduce energy use, increase livability and protect the environment.

Planning and design decisions related to the built environment-existing buildings, streets, commercial development, parks, schools and more-are as important as the decisions related to the natural environment. To assess how to best take advantage of the surroundings, the project team may need to do considerable analysis and develop a number of schematic designs. Community Support An important aspect of green multifamily

housing is creating conditions that foster economic and social well-being in the community.

Many of the Planning & Design measures offer tremendous community benefits, ranging from reduced traffic congestion to more attractive opportunities for recreation to greater economic vitality. For the developer, engaging municipal representatives and community leaders early in the design process can pave the way to a much more successful project.

Overview of "Green Concept" in Building Design

There are large amounts of materials used and energy consumed during construction and operation of an average building. One of the growing areas of interest in many North American universities and colleges is the implementation of green technologies when constructing new facilities in order to produce buildings that are more energy efficient and have less impact on the natural environment during operation.

The world's population has grown exponentially since the Second World War, and there is currently pressure on available land and natural resources. As a society, we will eventually be faced with the depletion of our most widely used source of energy, the non-renewable fossil fuels. Many people and organizations are coming to the conclusion that average person's daily energy consumption in North America will not be sustainable in the future. There are many ways in which these organizations are taking steps reduce consumption such as developing new types of vehicles, energy sources, recycled materials, and designing environmentally friendly buildings.

These environmentally friendly buildings are also known as "green" buildings and have been in use for over years in North America since the birth of the environmentalists' movement in the 1960s.

Why Going Green Makes Sense

A green building may cost more up front but, in the long run, will save money through lower operating costs over the life of the building. The green building approach applies a project lifecycle cost analysis to determine the appropriate up-front expenditure. This analytical method calculates costs over the useful life of the asset.

The integrated systems approach ensures that the building is designed as one system rather than a collection of stand-alone systems. Some benefits, such as improving occupant'' health, comfort, productivity, reducing pollution and landfill waste, are not easily quantified.

Consequently, they are not adequately considered in cost analysis. For this reason, consider setting aside a small portion of the building budget to cover differential costs associated with less tangible green building benefits or to cover the cost of researching and analyzing green building options.

Even with a tight budget, many green building measures can be incorporated with minimal up-front costs, and they can yield enormous savings. Retrofitting Existing Buildings It's not impossible to transform an existing building to a green one, but it can be difficult. There are some easy items that can be retrofitted into an existing building at relatively low cost and, in time, often pay for the retrofit. Existing buildings require an upfront investment to replace something that already exists and is, presumably, in working order.

However, not all of the necessary alterations need to be done at once. Start with what needs to be fixed or repaired such as leaking faucets or toilets. If the building is being remodeled, keep the green concept in mind and use recycled material and paints that are environment friendly. Whether the building is old or new, installing low-flow fixtures is one of the easiest ways to save money and conserves water.

If leaking faucets or fixtures cannot be repaired, replace them with ultra-low-flow fixtures. Some of the easiest green retrofits to an existing building are methods for decreasing power usage and water consumption. For example, anytime a light bulb burns out, replace it with an ultra-low-energy use bulb. When landscaping, use native plants and garden designs that require less (or no) irrigation.

New Buildings Location is as important in green building as it is in real estate.

One should try to orient the building for the best environmental fit, such as positioning the building to take advantage of the sun or leaving as much of the natural landscape, including trees and other plant life, as possible.

Set the elevation of the building to minimize earthwork and balance the earth to be removed with the earth to be filled. If there are any wetlands, do not disturb them. It takes many years for nature to make topsoil. Save it; don't waste it. Take into account all of the utilities that you may need to extend to the building, keeping distance

to a minimum. Consider where entrance or exit roads are placed, and keep the road grade to a minimum.

Take advantage of the prevailing wind direction for wind turbines. The building itself can have many green options-from using recycled building material, to paints and finishes that have fewer (or no) chemicals, to heating and cooling the building, to using as much natural sunlight as possible.

Historical Review of Gordon College

The conception of the Gordon Memorial College was Lord Kitchener's and its foundation was due entirely to him. On his return to England after the victory at Omdurman, he issued an appeal at the Mansion House on November 1896, for funds to erect and endow a college at Khartoum as a pledge that his aspirations are at length to be realized. The college was formally opened by Lord Kitchener in November, 1902. The total absence of any higher education in the country hitherto, rendered it impossible to commence by providing anything in that nature.

As first constituted therefore, the college consisted of:

1. A sheikh's college for training teachers and judges of Muslim courts.
2. A primary school for giving instruction in the ordinary elementary subjects and in English language.
3. Instructional workshops for training carpenters and filters.
4. The Welcome Tropical Research Laboratories, equipped by the generosity of Mr. Hennery S. Welcome in 1905.

Higher school was started in the same premises containing sixteen pupils; all were to begin as trainee engineers and surveyors. Later a literacy section was added. By 1910 the primary schools had been moved into separate building, and high school increasingly developed to function as a college.

Why is the University of Khartoum a Green University?

The greenness of the University of Khartoum is attributed to natural as well as man- made factors.

1. Its Unique Location

a) The main campus (main buildings of the university)

This site was selected carefully and perfectly for the initiation of the University of Khartoum. It was unique since it occupies the left Bank of the Blue Nile for the main buildings of the University. It is worth to mention that these buildings include: top managers' offices such as the vice chancellor's office and the following Faculties: Science, Arts, Geographical and Environmental Studies, Economics, Engineering, Graduate college, School of Mathematics, Institute of Environmental Studies. Therefore, this area is characterized by mild temperatures and natural beauty or aesthetic value.

It occupies a large area and this of course gives the university the opportunity for any future development in its different faculties.

The main building of the university is bordered by three essential streets namely Nile road from its Northern side, Jamaah that traverses the main building in the middle and Goumhoria Street which represents the southern boundary. However, Sudan library and Institute of Environmental Studies are also located in this street.

All this makes the main buildings of the university more accessible for people coming from any part of the three towns: Khartoum, Omdurman and Bahri.

Figure 1: The main gate of Khartoum University.

b) Shambat Complex

Four faculties are hosted there: Agriculture, Veterinary Science, Forestry and Animal Product ion. This area is located in Shamabat which is a famous agricultural area and therefore it provides the students of the previously mentioned faculties the opportunity for practical application of different issues related to their different specializations. Moreover, it neighbours Shamabat Bridge which links Bahri to Omdurman. This is a privilege since it eases the accessibility to these faculties.

c) Medicine Complex

Three Faculties comprise this complex: Medicine, Dentistry and Pharmacy. Their uniqueness comes from

very simple facts: neighboring Khartoum Teaching hospital, Dentistry Hospital and this complex is bordered by Qassar street eastwards. Moreover the area is accessible since it is located at Khartoum city centre.

2. Its Unique Design and Construction

Khartoum university buildings are green buildings i.e. more friendly with the environment due to the following factors:

- Red bricks were used as a main building material which months and keeps the building warm during winter season.

- Walls are hollow to allow better aeration, in complimentary with its location which provides mild temperature in comparison to other parts of the capital, and therefore needs less energy for cooling.

Figure 2: The main library of Khartoum University.

It is worth to mention that at that time (the beginning of the 20th century) there was no electric supply in Sudan.

-High ceilings and large windows improve ventilation and reduce energy used for cooling.

Figure 3: Red bricks hollow walls, buildings.

3. Students 'Hostels

Prior to the Higher Education Revolution the students had enjoyed living in hostels neighbouring their faculties and enjoying free well-prepared and nutrition food. These ideal conditions were reflected on high caliber graduates who are now leading the development not only in Sudan but also in Gulf countries, UN posts and in North America as well as other European and south east Asian countries. The University of Khartoum's students were and are still the best in the Sudanese Secondary School certificate i.e. they are the cream of the cream.

4. Green Landscaping wherever you go

Figure 4: Green areas surrounding the main library.

5. Presence of Sports Areas (football, Basket tennis and Swimming Pools)

6. Ever green trees surrounding the outer walls of the university and along internal streets in all faculties improve the teaching environment and add to the natural beauty as well as help in reducing high temperatures by creating a microclimate with mild temperatures.

Figure 5: Green areas wherever you go.

7. Lecture rooms and theaters as laboratories are not neighbouring cafeterias and students' activities.

8. University's Staff is of high caliber.

Conclusion

University of Khartoum is a pioneer green university.

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