Green Architecture as a panacea to the Environmental effects of Architectural development in Nigeria.

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ABSTRACT

The aim of this study was to employ Green Architecture as a panacea to the environmental effects of Architectural development in Nigeria. There are a lot of environmental effects posed by the built environment, this may have arose as a result of Architectural development channeled towards a radical development of an artificial environment. Architectural development will be catastrophic without setting a balance between the natural environment and built or artificial environment. As much as Architectural d3evelopment is essential to foster progress so also due consideration must be given to the Adaptation and Sustenance of the built environment. Green Architecture which was carved out from post-modernism fulfills best practices in environment development. This is true because Green Architecture is the most tangible reflection of a profound change in ecological patterns that has occurred over the last one hundred years, but the most common problem in Architectural development are the environmental effects engulfed in its adaptability and sustainability, most especially in the tropical regions like Nigeria considering the inadequacy of Electricity, therefore, the promotion of adaptability and sustainability in Architectural practice is of great importance which is the central aim of this study. The researcher's primary source or method of data collection was based on Analytic studies using descriptive method of data analysis to evaluate the draw backs of existing Architectural practice. Studies has shown that most of these practice failed to anchor its developmental strives to adaptability and sustainability most especially in developing countries due to so many deficiencies. The Natural elements of the environment has not been fully harnessed in maintaining ecological balance in the environment. To accomplish this development, Architectural development must benefit from an integrated design approach that focuses on meeting a list of objectives through a tropical design that offers owners and users an increased working satisfaction and productivity, improved health, greater flexibility, enhanced energy and environmental performance at little or no cost.

Keywords: adaptability, environment, sustainability.

1. Introduction

According to the scientific community, climate change is happening and its effects will have severe consequences for our society and environment. Reducing energy use in buildings is one of the most important ways to reduce humans' overall environmental impact. Nearly unanimous scientific consensus has established that climate change is occurring as a result of human activity. Mathematical models of global climate change have linked a human-driven increase in GHGs (Green House Gases) to an increase in global temperatures (especially in the past 250 years, since the industrial revolution). The primary source of this increase in GHGs has been attributed to the emissions generated by the use of fossil fuel-based energy. Climate change has been linked to observable disturbances such as the loss of mountain glaciers and ice cover on the Earth's Polar Regions, changes in the timing of the spring bud-break, and an increase in the frequency and intensity of extreme weather events such as cold waves, heat waves, large storms, hurricanes and tornadoes, floods, and droughts. Climate scientists have theorized that human civilization is in danger of crossing a threshold or "tipping point" that could lead to more radical changes in the global climate, and that could accelerate the onset of either a new "hotter and wetter" age similar to the Earth's environment before the appearance of human beings, or a new ice age. (Intergovernmental Panel on Climate Change, IPCC Fourth Assessment Report [AR4]).

Scientific estimates place the window of opportunity for reversing this trend in the very near term—according to some, as briefly as over the next ten years. After that, the global climate may change irreversibly, and humans will just have to adapt. In many arenas of implementing real practical change, architects, engineers, and builders are amongst the few with the skills and resources that provide real, practical, cost-effective, and inspiring solutions for buildings. The effects of Architectural development on the environment Architecture and Environmental Studies are natural companions. It is impossible to design good buildings without understanding their relationship to natural systems. It is also impossible to understand the natural environment without knowing how human intervention affects it – both positively and negatively. As man and nature begin to recognize their interdependence, the study of environment takes on a whole new meaning. Architecture and the Environment encourages exploration of these relationships from a variety of perspectives. During modern era of human development, growth of towns and cities displayed a separation between nature and human activities. This was not the case in pre-modern times, when human settlements either integrated or co-existed peacefully with the nature. After the arrival of modernism and the growth urbanism, modern homes and high rise habitats replaced gardens. Fast growing populations and changes in lifestyle contributed to the destruction of garden cities (Samiei, 2012). Before the rapid expansion in human population that began after the Industrial Revolution, cities were relatively small, few in number and their impact on the natural world was limited. There had been human-induced extinctions of wildlife caused by hunter-gatherers, the deforestation caused by the introduction to fire as a means of cooking and heating, but for the most part, the ecological footprint of human settlements was light because they were embedded bio regionally and their size permitted provisions by the immediate surrounding natural environment. Ecosystems provide our basic human and social needs. The biosphere nurtures our mind and soul, as well as our stomachs and lungs. The modern city is organic process, but one with an unhealthy bio system. The biophilia hypothesis suggests that humans have an innate tendency to affiliate with other living organisms and living processes. Humans require contact with a biodiverse world to stimulate the development of their emotional, cognitive, and social potential. As the living community of other organisms is reduced and human interaction with that community is lost, there is an extinction of experience that results in a loss of real ecological knowledge and emotional attachment to nature. These developments were made possible by the large-scale exploitation of fossil fuel resources which offered large amounts of energy in an easily portable form, but also caused widespread concerns about pollution and long-term impact on the environment. In the Nigeria, architectural development most often are not geared towards sustainability, urban dwellers became increasingly disconnected from nature, nowadays many no

longer understand the connection of a healthy ecosystem and healthy cities. Landscapes on and around our buildings and infrastructure can be more than an optional ornamental extra but a multi-functional layer of soil and vegetation that controls surface water, provides food and wildlife habitat and keeps us cool, fit and sane. To make this transformation from grey to green will require panoramic, trans-disciplinary thinking and coordinated action (Grant, 2012). The concept of the built environment both embraced and rejected the idea of a balance with our natural environment. Home was a safe place against wild and cruel nature outside. People feared natural disasters, wild uncontrollable animals and untamed growth of forest and woodland areas. Presently, people destroy or neglect our natural infrastructure due to our focus on development with building of man-made structures that has tempered with the ecosystem tremendously. The realization that nature embraces the city has powerful implications for how cities are built and maintained and for the health, safety, and welfare of each resident.

Many cities have suffered from failure to take account of natural processes. The cost of disregarding nature extends also to quality of life. The problems of contemporary urbanization are still persistent, Nature has been seen as a superficial embellishment, as a luxury encountered only in parks and gardens. Civilizations and governments rise and fall, traditions, values, and policies change, but the natural environment of each city remains an enduring framework within which the human community builds. A city's natural environment and its urban form, taken together, are a record of the interaction between natural processes and human purpose over time. Together they contribute to each city's unique identity (Whiston Spirn, 2002).

It is our relationships with our environment and other species that make us part of an ecosystem. The healthy functioning of a natural system, including their life-sustaining processes, depends on all species participating in a coordinative way.

Thus cities should be an extension of our natural environment. Our decision to form a balanced relationship between nature and city is determinant; nature has complicated internal rules that define biodiversity as a collective life support system. There is a need for the city to connect to organic structures systematically.

2. Study Area

Nigeria, republic in western Africa, with a coast along the Atlantic Ocean on the Gulf of Guinea. Most of Nigeria consists of a low plateau cut by rivers, especially the Niger and its largest tributary, the Benue. Nigeria has a tropical climate with sharp regional variances depending on rainfall. Nigerian seasons are governed by the movement of the inter-tropical discontinuity, a zone where warm, moist air from the Atlantic converges with hot, dry, and often dust-laden air from the Sahara known locally as the harmattan. During the summer, the zone of inter-tropical discontinuity follows the Sun northward. As a result, more and more of the country comes under the influence of moisture-laden tropical maritime air. Thus, much of the country experiences a rainy season during summer. As summer wanes, the zone shifts southward, bringing an end to the rainy season. Temperatures are high throughout the year, averaging from 25° to 28°C (77° to 82°F). In the higher elevations of the Jos Plateau, temperatures average 22°C (72°F). Northern Nigeria typically experiences greater temperature extremes than the south. Rainfall varies widely over short distances and from year to year. Parts of the coast along the Niger Delta, where the rainy season is year-round, receive more than 4,000 mm (160 in) of rain each year. Most of the country's middle belt, where the rainy season starts in April or May and runs through September or October, receives from 1,000 to 1,500 mm (40 to 60 in). Within this region, the Jos Plateau receives somewhat more rain, due to its higher elevation. In the dry savanna regions, rainfall is especially variable. The region along Nigeria's northeastern border receives less than 500 mm (20 in) of rain per year, and the rainy season lasts barely three months. Vegetation also varies dramatically at both the national and local level in relation to climate, soil, elevation, and human impact on the environment. In the low-lying coastal region, mangroves line the brackish lagoons and creeks, while swamp forest grows where the water is fresh. Farther inland, this vegetation gives way to tropical forest, with its many species of tropical hardwoods, including mahogany, iroko, and obeche. However, only in a few reserves—protected from the chainsaw and the farmer—is the forest's full botanic diversity intact. Elsewhere, forest is largely secondary growth, primarily of species like the oil palm that are preserved for their economic value. Forests cover only about 12 percent (2005) of the country's total land area.

Immediately north of the forest is the first wave of savanna: the Guinea, or moist, savanna, a region of tall grasses and trees. The southern margins of the Guinea savanna—which has been so altered by humans that it is also called the derived savanna—were created by repeated burning of forest until only open forest and grassland were left. The burnings destroyed important fire-sensitive plant species and contributed to erosion by removing ground cover. Tropical forest is giving way to the Guinea savanna at such a rate that the only forests expected to survive the next generation are in reserves. Beyond the Guinea savanna lies the drier Sudan savanna, a region of shorter grasses and more scattered, drought-resistant trees such as the baobab, tamarind, and acacia. In Nigeria's very dry northeastern corner, the semi-desert Sahel savanna persists. Throughout these drier savannas, drought and overgrazing have led to desertification—the degradation of vegetation and soil resources. Desertification is a major problem in Nigeria, made worse by massive water impoundment and irrigation schemes. Uncontrolled grazing and livestock migration put tremendous pressure on the environment in some areas. Other environmental threats include poaching and settlement within protected areas, brushfires, increasing demand for fuelwood and timber, road expansion, and oil extraction activities. Nigeria has an organized system of nature preserves, game reserves, and national parks in addition to a forest management system, but most management is carried on at the state level. Law enforcement and protected system infrastructure are lacking, and abuses of protected land are common. Nigeria cooperates with Cameroon, Chad, and Niger in the joint management of wildlife in the Lake Chad Basin. The country also participates in the African Convention on the Conservation of Nature and Natural Resources. Several Nigerian groups have campaigned actively, but with little success, to compel the government and major oil companies to introduce environmental safeguards. In 1988 the government created the Federal Environmental Protection Agency (FEPA) to address problems of

desertification, oil pollution, and land degradation, but the FEPA has had only a minor impact. In 1995 the weak and fragmented environmental movement was dealt a sharp blow when the government executed Ken Saro-Wiwa, a well-known writer who struggled to stop environmental degradation in the Niger River Delta. In many parts of the country, farmers have practiced environmental protection for centuries. Their techniques include planting several different crops in a single field at once to cover the ground more evenly and thereby reduce erosion and increase fertility; planting and maintaining farmland trees and hedgerows to reduce erosion; applying manure to farmland to maintain soil fertility; and, in certain areas such as the Jos Plateau, terracing steep slopes. (Stock, Robert. "Nigeria." Microsoft® Encarta® 2009 [DVD]. Redmond, WA: Microsoft Corporation, 2008.) The Nigerian territory has drastically been compromised by a non-environmental friendly Architectural development in most areas which has affected the environment negatively, most especially the biophysical environment that has witnessed change in climate, pollution of various kinds and degrees. Most residence has little or no knowledge on the importance and protection of the natural environment. The environmental effects on Architectural development in Nigeria is growing by the day and needs urgent rescue of the degraded environment.

3. Literature Review

Ecological problems are often the result of urban design, planning and human consumption problems: our land uses, transportation systems, buildings, and technologies often do not fit comfortably in the human or natural biosphere. Ecological design requires the ability to comprehend patterns that connect to nature, which requires working outside mainstream disciplines to see things in their larger context. Ecological design is the careful meshing of human purposes with the larger patterns and flows of the natural world; it is the careful study of those patterns and flows to inform human purposes (Orr, 1992). This design approach must be organized around what can be called the "ecological design arts," around developing the analytic abilities, ecological wisdom, and practical wherewithal essential to making things fit in a world of humans, microbes, plants, animals, and entropy (Orr, 1992). Ecological design was defined by Sim Van der Ryn and Stuart Cowan as "any form of design that minimizes environmentally destructive impacts by integrating itself with living processes" (Van der Ryn, Cowan S, 1996). Ecological design is an integrative ecologically responsible design discipline. It helps connect scattered efforts in green architecture, sustainable agriculture, ecological engineering, ecological restoration and other fields. The condition of urban ecological systems can be useful indicators for comparing the effects of climate change, land use patterns, organismal components, and substrates on human and biological health. (Zipperer et al., 1997; Carreiro et al., 2009) it's not just the methods and materials used to construct a building that affects the environment. How it's built to operate has a huge impact as well. For example, using non-sustainable materials in the construction of the building has a temporary negative effect. The use of a non-efficient HVAC (Heating, ventilation and air conditioning) system will have a negative effect on the environment. The purpose of ecological design is to create a vision of how the natural world and the human world can be rejoined by taking ecology as the basis for design. Architectural development could either upgrade or degrade the environment.

Ken Yeang, famous Malaysian Architect and one of the pioneers in ecological Architecture, has offered a set of principles / guidelines for designing with nature:

1. The ecological approach to design is about environmental bio-integration.
2. Our built forms and systems need to imitate nature's processes, structure, and functions, as in its ecosystems.
3. The process of designing to imitate ecosystems is Eco mimesis. This is the fundamental premise for eco design.
4. There is much misperception about what is ecological design. We must not be misled and seduced by technology.
5. The other common misperception is that if our building gets a high notch in a green-rating system, then all is well.
6. Ecosystems in the biosphere are definable units containing both biotic and abiotic constituents acting together as a whole. (Yeang, 2008)

Ecological design principles create a sustainable world with increased energy efficiency, fewer toxics, less pollution (both indoor and outdoor pollution) greener and healthy buildings, accessible green open spaces, reduce noise pollution, healthy social relationships, reduced waste and a happy well-adjusted citizenry. Rain-screen facades provide habitat for cavity dwellers such as kestrels and birds. For many sensitive species, life in close proximity to Architectural development would be intolerable, yet numerous species would flourish under these conditions, and humans would have day-to-day contact with the wild. Assuming a thoughtful position between extreme segregation and integration, how consistent should the relationship between built and natural orders be (or between sub-orders within these) landscape-like building forms which closely synchronized with their surroundings, an approach that holds great currency in contemporary architectural circles (Muller, 2007)

A growing body of literature under the rubric of landscape urbanism has stressed the closing of boundaries between architecture and landscape, between the ecological and cultural. Recent discourses and architectural models offer advances in theoretical thinking and design expressions. However, actual outcomes in terms of improved ecological functions in the urban environment remain to be seen (Hou, 2012). Vertically, eco-skyscrapers can protect valuable open space by building up, rather than out. And the outer skin of the building could produce substantial amounts of energy for heating and cooling the entire structure as well as provide energy to adjacent structures.

4. Discussions

An urban ecosystem includes people among the living things, and the structures built among the non-living things. In an urban ecosystem, humans influence ecological factors (plants, air, soil, animals), and human decisions (where and how to build houses, parks, highways, schools) are influenced by ecological factors. Social factors are a key component of a viable and healthy eco system. Respect for cultural and ethnic diversity and the recognition of multi-cultural leadership as in the case of Nigeria are important inputs to a healthy city. Urban Ecology is the study of ecosystems that include humans living in cities and urbanizing landscapes, the application of the principles of ecology to a study of urban environments. The term "urban ecology" has been used variously to describe the study of humans in cities, of nature in cities, and of the coupled relationships between humans and nature. Urban ecology is the study of the co-evolution of human-ecological systems. It is an emerging, interdisciplinary field that aims to understand how human and ecological processes can coexist in human-dominated systems and help societies with their efforts to become more sustainable and adaptability of the built environment. http://www.forestrynepal.org/notes/biodiversity/introduction/conservation-biology/urban-ecology. Urban ecologist Zipperer and Carreiro have identified four interrelated factors of an urban ecosystem: The prevailing climate, the substrate, the resident organisms and their residual effects, The time over which the first four factors have been acting, which can be summarized as the history of the system. (Zipperer et al., 1997; Carreiro et al., 2009) Urban ecosystems are diverse, and include human activities that sustain human life forms, (infrastructure; roads, dams and buildings) and biological inventory (plants, wildlife, water systems, food systems and microbes). Architects encourage and forge mutual relationships with the diverse stakeholders and professionals who deal with planning and design of the built and natural environment. It is necessary to work as a team and in the spirit of cooperation with urban agriculturist, landscape designers, biologist, environmental justice advocates, urban conservation officials, green economy / jobs advocates, wildlife managers, clean water and wetland activist, public health activist, artist and musicians, air quality experts, policy makers, sanitation and waste management officials, community organizers, builders, environmental educators and many more who have a vested interest in visioning a healthy urban environment. It is of great need to embrace a critical analysis of environmental issues and problems as a way to foster a systems approach to caring for our fragile environment. Introduces a systems design model that cuts across academic and professional boundaries and the divide between social and physical sciences to move towards a transdisciplinary approach to environmental and social problem-solving. This approach will also result in high quality building design, integrating greenery, natural building materials, natural light and water in a harmonious balance. Architects need to make buildings that are friendly to the environment and more green which can be adaptable to the surroundings, in other words, they need to create buildings that are energy efficient, green buildings or sustainable buildings are designed to reduce the overall impact of the built environment on human health and nature. In the light of this, some environmental effects risen from Architectural development in Nigeria and ideal situations are as follows:

- Natural views, green space, trees and water features provide significant social, economic and environmental impact. They increase property values; enhance worker satisfaction; and have a positive effect on user health and well-being. Environmentally, impacts include cooler air temperature, produce oxygen, reduce airborne pollution and can help reduce overall energy use.
- Use of sustainable design features including energy saving techniques, reduces energy use and costs.
- Internal space allocation significantly impacts on effectiveness, efficiency, comfort and satisfaction in all sectors. A variety of space affording different environments is beneficial in most sectors.

- User comfort increases productivity, satisfaction and well-being, contributed to by good-quality lighting, including natural lighting, air-quality, temperature and acoustics.
- Areas with character, particularly if these involve historic restoration, can rejuvenate areas and give them a unique sense of identity.
- Public realm, which is felt to be accessible and safe, increases use and provides for social interaction.
- Mixed-use development helps regeneration by increasing an area's vibrancy, attracting businesses and residents and creating jobs. It also reduces harmful environmental impact from car emissions where car use is low.
- Accessible, well-connected spaces attract business investment and increase use. Low-traffic environments increase social use and give rise to health benefits from increased pedestrian use.
- Enhanced local pride, identity, ownership and use and reduced crime arises from involvement of users and stakeholders in the design of both buildings and places.

- Efficiently using energy, water, and other resources
- Protecting residents' health and improving people's productivity
- Reducing waste, pollution, and environmental degradation

Benefits of Green buildings or green Architecture includes the following: Green buildings (green architecture) are a trend these days for their positive effect on the environment because they take landscaping into account. Green buildings also managed in the construction process to make sure that any waterways remain unpolluted with construction by-products. Green buildings also have benefits that are luxury, like better indoor air quality. Many studies have found that they also lend themselves to a better work environment. These benefits which include the use of natural daylight, big windows, and good indoor air circulation, dramatically increase productivity and as residential buildings, they have substantial effects on their residents, as well. The relationship between architecture and environment is very strong and can't be denied as we see to have a sustainable and healthy environment we have to take good care of the buildings that are built in it and also to have sustainable buildings we have to take into consideration the environment surrounds and its impacts. Ecological continuity describes the process of uninterrupted succession, or union with a natural inventory, i.e., plant life, waterways, and open space, in an effort to maintain the natural and healthy integrity of a biosphere. Ecological linkage describes the process of utilizing ecological design principles as a key factor for designing and restoring damaged natural and human habitats. As it applies to building design, the concept of continuity begins with knowing the ecology of site and the limits of construction activity. The process of constructing a building can adversely affect the natural environment. Every site possesses an ecological limiting capacity; to which if overburdened, the site suffers irrevocably ecological damage, such as soil erosion and destruction of local biodiversity. Achieving these linkages ensures a wider level of species diversity, human and wildlife interaction and social and physical mobility and sharing of resources across municipal boundaries. Such real improvements in connectivity enhance biodiversity and further increase habitat resilience and species survival. Providing ecological corridors and linkages in regional planning is crucial in making urban patterns more biologically viable. The footprint print we leave after construction process is complete will have a minimal impact on the site's ecology, and if the site remains vegetated (and not entirely paved) it provides greater land area for surface water percolation back into the earth. We must ascertain the ecosystem's structure and energy flow, its species diversity and other ecological properties. The secret of designing successful ecological architecture is to embrace the notion that the site is a holistic living natural element, similar to a tree; and functions as a part of an organic living environmental inventory. This linkage of these organic elements must be extended vertically and horizontally, with vegetative connectivity stretching upwards within the built form to its roofs cape, and horizontally in conjunction with the ground floor contours of the structure.

More than enhancing ecological linkages, we must biologically integrate the inorganic aspects and processes of our built environment with the landscape so that they mutually become eco-systemic. This is the creation of human-made ecosystems compatible with the ecosystems in nature (Yeang, 2007). Architects and environmental planners should consider buildings and other landscape structures as organic elements of a larger ecosystem. Ecologically built structures will create small and less stressful environmental footprints, which will promote ecological connectivity with rehabilitated vegetative networks, which in turn will enhance the quality of life of human and wildlife occupants. One strategy assigns the built and natural to distinct realms, where wildlife habitat cores are pushed to the perimeter of the site, providing a clearing for housing, commerce, parking, and recreation. Other efforts to achieve significant "inter-digitation" between built and natural realms include adding green roofs to structures. Green roofs serve as stepping-stone corridors for various avian species as well as a decrease in heating, ventilation, and HVAC systems.

5. Conclusions / Recommendations

Green Architecture as a panacea to the environmental effects of Architectural development in Nigeria goes beyond the use of environmental friendly construction technics and building materials but the integration of the built environment into the natural environment. This can be achieved when Architects and Planners design to complement the natural environment, integrating the natural features of the environment to sustain made-man structures and at the same time employing adaptability as a tool for continuity. Keeping the built environment in good condition and in continuity is highly dependent on sustainability, sustainability is highly achieved when the natural environment is fully utilized to keep the built environment in existence, Hence, Green Architecture. Green Architecture is an affirmative solution to virtually all environmental effects of Architectural development ranging from lightening/ventilation to biophysical pollutions. Green Architecture is simply the use of the natural environment and its elements for the ecological balance of the environment. Its continuous the recycling process of the built environment with sustainability as a major component for survival at little or no cost. Energy is renewed from every interaction with the biotic features of the environment. In conclusion, Sustainable architecture has one overall goal: to reduce the negative environmental impact of the built environment on the natural environment thereby harnessing these natural elements to improve and continue the existence of the built environment at little or no cost. This is accomplished through efficiency as well as the minimal use of materials, energy, and development space. Here are a few of the most common techniques used. Energy consumption is potentially the largest negative environmental impact of every environment as in the case of Nigeria, so green building practices focus heavily on energy efficiency. Energy consumption is reduced in many ways. For example:

- Increasing ventilation to remove polluted indoor air.
- Using the best conductors for electrical connections, reducing energy consumption.
- Incorporating solar building designs.
- Improved insulation of a building to prevent heat dissipation.
- Installation of renewable energy sources.
- Energy intelligent design.
- Reducing wasted internal space.
- Design for a climate
- Design for the physical and social environment
- Design for time, be it day or night, a season or the lifetime of a building
- Design a building that will adapt and grow over time.

Today it is very cost-efficient to incorporate recycled and sustainable building materials into any commercial construction project. Doors, wood, dimensional stone, and copper can be reclaimed from a demolition project and reused during new construction. Sustainable materials such as cork and bamboo can be used for office flooring. Managing the flow of runoff and eliminating the disruption of natural drainage are important measures to reduce the environmental impacts. There are many other ways that sustainable architecture can reduce the negative environmental impacts of Architectural development in Nigeria. The environment should come first at the outset of any construction project. This means that developers must take the protection of the environment seriously. According to the regulations, developers should “design, install and maintain” erosion controls to “minimize the discharge of pollutants.” These controls should include mechanisms to curtail storm-water controls and by minimizing the “amount of soil exposed during construction activity.” This is an important component of the construction process and it must be initiated immediately whenever excavating work is been carried out on a site. The rules indicate that the stabilization process must be completed within a time period applicable to local construction rules and regulations. There are many chemicals used during the construction process, many of which can be quite harmful to both workers and the surrounding environment if not handled correctly. Therefore, it is recommended that developers design “install, implement and maintain effective

pollution prevention measures" during the course of a project, to ensure pollutants are discharged correctly and safely with limited impact on the environment. The green building process uses environmentally friendly materials that can save 250 metric tons of CO_2 emissions annually, according to environmental group LEED. Furthermore, according to a new report by Dodge Data and Analytics, green building continues to double every three years, with 60 per cent of construction projects expected to be green by 2018 and roughly 70 percent of the survey's respondents citing lower operating costs as the "greatest benefit" of building green. The research also says that increasingly construction firms are being asked to build projects that are both sustainable and energy efficient.

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