

Design, Build and Live Sustainably: Contemporary Philosophy for Architecture in Developing Countries

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Abstract

Architect, have special mandate of bringing man in harmony with his environment, and the critical tool at his disposal to achieving this is “Design”. The focus of this paper is to x-ray how the architect can bring comfort and gain sustainability in his buildings through design and construction. Again, how the consumer of his products (the clients, and his tenants) could acquire consumption ethics that will create sustainable living practices. The paper is of the opinion that a breakdown of the philosophy that will lead architects in developing nations to a green world must include critical thinking and ethical practices towards sustainable green world agenda. This will come from architectural products that emanate from design inception and not as after thoughts. The designs must address thermal comfort, and energy efficiency as key factors that will help check global warming, climate change and increasing temperature. The architect is charged to employ passive architectural practices in executing this agenda. The papers requests that architects stick to building codes and developmental regulations in all projects they execute. Architects' designs should express ideal mastery of their trade, for their products to live from cradle to cradle, and not cradle to grave. When this happens, his clients lives well, the children, grandchildren, great grandchildren and their children will live as well as they lived, without hurting nature. A green world is born. That is sustainability.

Keywords: *Design, Build, Environment, Live and Sustainability*

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Background to the Study

Environment according to Enger and Smith (2006) is everything that affects an organism during its life time. This is divided into abiotic (non – living) and biotic (living) factors. Architecture depending on concept is both abiotic and biotic. Architectural products may be abiotic (nonliving), but by design, construction and operation starts living and become biotic. This could further be examined through the lens of buildings contributing immensely to global warming. Buildings are products of architects and as rightly noted by Le-Corbusier (1977), the architect remains in front among others charged with the task of providing shelter for man, one need that man has ever sought to provide and improve on for himself ever since he occupied the cave. The difference between what the architect does today and what man has continuously done for himself, right back medieval era is the advancement in technology, which has enhanced man's living and environment, yet the primary need has remained shelter (Alozie and Eze, 2019).

Technology indeed has redefined architecture. Today, smart buildings, and buildings with artificial intelligence exist. Buildings such as the Burj Hotels in Dubai, the Sydney Opera House in Australia and many other contemporary works of architecture go a long way to measure the impact of technology in architecture. The underscoring element remains that the purpose for all is shelter, and they all remain the architects' creation (Alozie and Eze, 2019b).

These great works of architecture, especially the intelligent works are found mostly in developed nations like the United States, Europe, and some Asian countries, their occurrences if any in developing nations especially in Africa are rare and imported.

This paper therefore is of the opinion that architects in developing nations should think outside the content of their present knowledge, and start putting in practice more efforts that will enable their products provide sustainable green environment as is the case in developed nations. This could be done by ensuring that buildings naturally attain indoor thermal comfort, that there are energy efficient and that improved indoor air quality is guaranteed. Then, progressively architects in such locations could begin to dream and conceptualize higher intelligent schemes like his international counterparts in developed nations. This will enable them challenge indigenous engineers to come up with solutions to their thesis.

Architecture, has been defined in many ways, in fact it is said that every architect has his own definition for architecture, however, architecture is concerned with the creation of order out of chaos, a respect for organization, the manipulation of geometry, and creation of a work in which aesthetics plays far greater role than anything likely to be found in a humdrum building. Architecture has three conditions: Commodity, Firmness, and Delight (harmony of proportion, symmetry propriety and economy), this is also seen as beauty, firmness and convenience (Curl, 1999).

These definitions suggest that there is much in the built fabric that falls into the category of non-architecture, in simpler words therefore Curl (1999) defined architecture further as the art and science of designing a building, having qualities of beauty, geometry, emotional and

spiritual power, intellectual content and complexity, soundness of construction, convenient planning, many virtues of different kinds, durable and pleasing materials, agreeable coloring and decorations. Serenity and dynamism, good proportions' and acceptable scale, and many mnemonic association drawings on a great range of precedents. Little wonder therefore the claim by Frank Lloyd Wright, that an architect cannot bury his mistake, unlike the physician (Curl, 1999).

The architect then is described as a person having the prerequisite education that enables him to prepare, complicated plans, elevations, sections, site plans, and other preliminary and detailed drawings of simple and sophisticated building(s) with aesthetic content and having the knowledge and ability to supervise its construction in accordance with the drawings and specifications (Curl, 1999).

According to Louis Boullee (2006), Vitruvius definition of architecture as “the art of building possesses a fragrant error, he carefully noted that Vitruvius mistook the effect for the causes. Louis Boullee opined that in order to execute, it is first necessary to conceive, this he buttressed by reasoning that our earliest ancestors built their huts only when they had pictures of them in their minds (design).

It is this product of the mind and the process of creation, that constitutes architecture, and which can consequently be defined as the art of designing and bringing to perfection of buildings. He defined the art of construction as merely an auxiliary art which in our opinion could appropriately be called the scientific side of architecture.

The Architect's Approach to Sustainable Built Environment

The architect on engagement, is expected to conduct an analysis of the project required of him, and study the climate of the environment in which his project is to be built (Morgan, 2017 translator), of “Vitruvius; The Ten Books in Architecture. This a statement I strongly agree with and, see, architectural products as trees of different species and nature, some have deciduous foliage while others are as tall as Iroko, with all the varieties resulting from briefs from different clients. It is the briefs that classify and determine the designs, while the designs enforce the engineering, costing and other details of the building.

An understanding of environmental issues, particularly in terms of concepts and principles in architecture must be present at the beginning of the design process so that it can inform the initial schematic explanations. A response to the critical environmental issues must be at the core of any effective design and not merely an applied accommodation added later (Smith 2011). These issues are definitely not external to effective design, nor should they be considered only as corrective measures that allow one to do something illogical in terms of design. In fact an understanding of these principles is fundamental to design.

Sustainable Design Concept; elements and ethics

Architectural designs are said to be functional when all or most of the design elements are integrated. The task of doing this is only perfected when the architects acquires an integrated

training that allows his critical thinking to flow with his drafting skills. These design elements are seen in the following: Synthesis Proportion, Scale, Rhythm, Rhymes, Organization Order, Dominance, Diversity, Identity, Legibility and Unity.

This is arguably the aesthetic vocabulary of architecture, and special connotations of all constitute the basis for architecture. They are “intellectual tools” of architects that determines the wealth of their creativity. Rationalization pertaining to each one of these “intellectual design tools” can explain the basic reasons for the appeal or lack of it in a particular work of architecture, as no aesthetic analysis and no design can be successful without a good understanding of these basic elements. An understanding of these elements should be the fundamental preoccupation of all students of architecture and all architects (Henderson, 2012, Antoniades, 1992).

An important concept, which if understood, drags along the rest is “synthesis”. Synthesis has the same meaning as the word composition. Synthesis, therefore means “to put together” certain elements in a way that a new thesis is stated, a new position is created, a new work is generated. A work of architecture then is a work of synthesis in which elements are put together in such a way as to constitute an entity, to create a new thesis or a new statement (Antoniades, 1992).

To be more precise, the architect has to set for himself, targets that will enhance his productivity. The need to keep to professional ethics especially that which provides for prompt delivery of projects, as contained in engagement contract must be respected. This decision is often dictated by the deadline for the submission of the project; the utilitarian element of architecture therefore should help the architect to set this deadline.

Deadlines for projects delivery are ethical and must be honoured, because without it being imposed by reality or by the architect himself, then the work of synthesis might last forever, as there could always be a better possibility of putting the elements under consideration together. If that were the case, the architect would produce one unfinished work in his life and it would never be built. The good architect, therefore, must not only be able to put elements together in order to create a meaningful new project, the architect must very early in his process of design have a work schedule. The schedule, time, talent and skill of the architect define the success of his project. This is critical if his work will become a new thesis without plagiarism or repetition of his works. According to Antoniades (1992), works which are products of minimum time spent on the design stage may lack credibility as works of architecture. As such they must be challenged, and the architects in consideration should be aesthetically, artistically, and professionally questioned, and such practices are unworthy of architecture, because architects are disciplined professionals.

Discipline is the ability to exclude all other possibilities and work within the possibilities of professional ethics. Architecture as a discipline is practiced on the basis of certain pre-determined ethics.

Environmental Concept

The environment had been defined in Enger and Smith (2006), as everything that affects an organism during a life time, both abiotic and biotic factors. Man and his products (buildings), are thus factors in the environment, and there are environmental friendly architectural concepts that enables the environment in which man and his products live function better. Such architectural environmental friendly concepts include:

Green building designs, passive architectural measures that enable natural attainment of indoor thermal comfort, and energy efficient designs, the commitment of environmental designers, architects, landscape architects and urban designers to the enhancement of the human experience can best be realized through designs that are both aesthetically pleasing and socially meaningful (Fitch and William, 1999).

The ultimate task of architecture in the environment is therefore to act in favour of human beings. To interpose itself between people and natural environment in which they find themselves. Fitch and William (1999), seem to support earlier claim by Le Corbusier (1977), who empowered the architect with the mandate of bringing man in harmony with his environment. Bringing man in harmony in clean and pollution free environment, The architect today, perhaps ignorantly may have become guilty of polluting the environment which he is charged to protect.

This guilt, happens when his designs does not fall within the green building index, when the occupants of the buildings he designs depend on active measures to attain thermal comfort, and when the buildings among other defects fail to be energy efficient. The architect fails when he disregards the energy character of buildings, which Botkin and Keller (1998), observed to consume more than 40% of worlds total energy. Buildings are also known to be major contributor to pollution and environmental degradation. Energy used in operating buildings especially in developing nations is produced by burning fossil fuel, which produces Carbon Dioxide and contributes to global warming and climate change. (Botkin and Keller, 1998, Enger and Smith, 2006).

Global warming and Climate change arenot architectural friendly since it may cause increase in temperature. Increase in temperature affects indoor thermal comfort negatively in the tropics, and requires a lot of energy for cooling. (Henderson, 2012, Alozie, 2014), The architect can erase the ugly accusation of being an agent of environmental pollution by implementing, green building ideologies, thermal comfort initiatives and energy efficient building practices.

Green Building

Green building is the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life-cycle from siting to design, construction, operation, maintenance, renovation, and deconstruction. This practice expands and compliments the classical building design concerns of economy, utility, durability, and comfort. Green building is also known as sustainable or high performance building. (Means, 2011).

Green building is not just an assemblage of "environmental" components, nor a piecemeal modification of an already-designed, standard building. It is therefore much more effective taking holistic approach to programming, planning, designing and construction (or renovating) buildings and sites. This involves analysis of connected issues as site, climate consideration, building orientation and form, lighting and thermal comfort, systems and materials, and optimizing all these in an integrated design (Means, 2011).

Why Build Green?

Green building is a profession that seeks to give back more than it takes from our natural surroundings, the environment at large and, ultimately to help preserve the health of both people and our planet. All professionals involved in green building have a common goal, that of creating buildings that are sustainable, and ultimately regenerative. Green buildings professionalism begins with the architect drafting and designing the framework of the building itself; interior designers sculpting up the healthy interior space; engineers filling the efficient systems inside, from plumbing to electrical to mechanical. Contractors making sure that all eco-conscious elements are properly installed during construction; and facility managers keeping the place green after clearing off, construction waste.

Green building development has become needful because all over the world, cities are increasing, buildings getting taller and bigger and population growing. Humans have pushed inventiveness beyond the limits of what was ever thought possible. The innovations are followed by tradeoff, mostly on the environment. According to the Energy Information Association, buildings account for more than 30% of the waste output in United States, up to 50% of the energy usage, almost 75% of electricity consumption (Means, 2011). Large impacts associated with buildings include, air pollution, energy consumption and water scarcity.

Among several definitions of green building, this paper prefers working with that identifying green building as the product of design which is a movement in architectural and building circles, aimed at creating structures that are occupant and environmental friendly, and which considers criteria such as sustainability, energy efficiency and healthfulness. For the architect therefore to design, build and have his client live sustainably there is need to appreciate and imbibe green building ethics that sees the architect as more than a designer, but also a green building consultant.

To consult for sustainable environment; design, construct and operate, the architect needs to, facilitate the vision and goal setting with the client in terms of environmental aspect of the building. This comes in helping the client with the site selection, based on environmental issues such as regional resources (water, renewable energy etc.), urban infrastructure and site condition, determining if it would make more sense to utilize an existing building or to build a new one, and in assisting in optimum team selection with specialized expertise based on project goals., and recommend building orientation to best capitalize on natural resources such as maximizing day lighting and more (Henderson, 2012).

Thermal Comfort

Besides being aesthetically pleasing, the human environment must provide light, air and thermal comfort. Comfort is best defined as the absence of discomfort. People feel uncomfortable when they are too hot or too cold, or when air odorous and stale. Positive comfort conditions are those that do not distract by causing unpleasant sensations of temperature, draft, humidity or other aspects of environment. Ideally in properly conditioned space, people should not be aware of equipment noise, heat or air motion (Bradshaw 2006). Thermal comfort therefore is the state of mind that is satisfied with the thermal environment. It is thus the condition of minimal stimulation of the skin's heat sensors and of the heat sensing portion of the brain (Bradshaw, 2006).

American Society for Heating, Refrigerating and Air-Conditioning Engineers, ASHRAE (2004), defined thermal comfort as that express condition in which 80% of sedentary or partly active persons find themselves comfortable, in their environments, and that means absence of discomfort. Thermal discomfort in buildings results primarily from faulty architectural designs, construction and operational management. The architect being the principal consultant, is in vintage or pole position to check on the following factors that may impede on comfort. The local climate condition, Orientation, Ventilation, Building material, planning regulation, among many others. The above fall in the field of passive architecture, a proper application of them results into energy efficient buildings.

Ventilation

Ventilation has the ability to moderate the indoor thermal environment of buildings. When properly applied creates energy efficiency. Guidelines that will enable architects in developing nations achieve successful ventilation in buildings as noted by Rofail (2006) are,

1. In hot, humid climates, maximize air velocities in the occupied zones for bodily cooling, and in hot arid climates, the architect should maximize airflow throughout the building for structural cooling, particularly at night when the temperature is low.
2. Take advantage of topography, landscaping, and surrounding building to redirect airflow and give maximum exposure to breezes. The need to make use of vegetation to funnel breezes and avoid wind dams, which reduce the driving pressure differential around buildings must be encouraged and site objects should not be allowed to obstruct inlet openings.
3. The design should be shaped such that maximum area of the building is exposed to breezes.
4. Architectural elements such as wing walls, parapets, and overhands should be used to promote airflow into the building's interior.
5. It is of great advantage to have the longer face of the building, windows, doors and openings aligned to benefit from the prevailing wind, especially during summer, and where there is no prevailing wind direction, openings should be sufficient to provide ventilation irrespective of wind direction.
6. The architect should ensure that windows are located in opposing pressure zones. Having windows opening in opposite sides of a space, increases the ventilation flow. Opening on adjacent sides force air to change direction, providing ventilation to a

- greater area. The benefits of the window arrangement depend on the outlet location relative to the direction of the inlet airstream.
7. In situations where rooms have only one external wall, two widely spaced windows help provide better airflow.
 8. Where the openings are at the same level and near the ceiling, much of the airflow may bypass the occupied level and be ineffective in diluting contaminants there.
 9. The stack effect requires vertical distance between openings to take advantage of the stack effect; the greater the vertical distance, the greater the ventilation.
 10. Openings in the vicinity of the Neutral Pressure Level (NPL) are least effective for thermally induced ventilation. If the building has only one large opening, the NPL tends to move to that level, which reduces the pressure across the opening.
 11. An inlet window smaller than the outlet creates higher inlet velocities. The rule of the thumb is to have the outlet area 50% larger than the inlet area, assuming that they do not have a tendency to reverse roles with changes in wind direction.
 12. Openings with areas much larger than calculated are sometimes desirable when anticipating increased occupancy or very hot weather.
 13. Horizontal windows are always better than square or vertical windows, as they produce more airflow over a wider range of wind direction and are most beneficial in locations where prevailing wind patterns shift.
 14. Window openings should be accessible to and operable by occupants.
 15. Casement type windows are much less effective in comparison to sliding windows.
 16. Inlet openings should not be obstructed by indoor partitions. Partitions can be placed to split and redirect airflow, but should not restrict flow between the building's inlets and outlets.
 17. Vertical airshafts or open staircases can be used to increase and take advantage of stack effects. However, enclosed staircases intended for evacuation during fire should not be used for ventilation.

Energy Efficiency

Energy that is consumed in order to meet with the different needs associated with peoples heating and cooling energy needs (energy needed to avoid overheating). Energy efficient buildings are buildings built and constructed to use minimum amount of energy to ensure comfortable living, such as designing buildings to take advantage of passive solar potentials.

Net-Zero Energy Building (NZEB), always referred to as next generation energy concept already operational in many locations in developed nations is taking energy efficiency to a higher step, beyond energy saving. These new edge cutting projects produce as much energy as they use over the course of a year, making them net-zero in terms of energy use. These buildings practice best energy efficient strategies, in combination with renewable source which is produced either on or off site. The buildings still remain connected to electricity grid (in case the renewable energy source supply is unavailable). Net-Zero Energy Buildings are ultimately a necessary step towards energy independence. (U.S. Department of Energy "Net-Zero Energy Commercial Building, 2011).

Reducing energy use in buildings saves resources and money while reducing pollution and Carbon Dioxide in atmosphere. The easiest and least expensive way to solve the “energy problem” is not to augment energy supply, but to reduce the amount of energy need, and this could be done through intelligent design solutions that get buildings to respond to climate. Intelligent building designs that respond to climate consider heating and cooling factors. It understands the character of solar energy such as radiation, convection, and conduction as well as materials for windows and other openings. It involves integrated design that considers daylighting, passive and active solar heating and takes great advantage of renewable energy.(Means, 2011).

Architects possess the skill to design buildings that will be energy efficient. Some energy efficient buildings have the ability of generating its own energy, as in the case of Net-Zero Energy Buildings. Others depend on passive architectural design. Daylighting is an important component of energy efficient building design which the architect needs to harness from the inception of his design project and not as, afterthought.

Buildings have been repeatedly listed by scholars as accounting for 40% of total world energy usage. The implication therefore is that when buildings in developing nations become energy efficient, the percentage of energy used in operating them will become small and perhaps insignificant. Energy sources in developing countries are nonrenewable; their sources are from burning fossil fuel. Burning of fossil fuel is an operation that increases global warming and causes climate change. When buildings in developing countries become energy efficient, green environment will begin. There is a widely reported statement that calls for change in our attitudes if we sincerely desire to limit global warming.

Construction Concept

“Sustainability” is one of the world's most discussed topics, whose meaning is often clouded by differing interpretations and by a tendency for the subject to be treated superficially. For most companies, countries and individuals who do take the subject seriously the concept of sustainability embraces the preservation of the environment as well as critical development of related issues such as the efficient use of resources, continual social progress, stable economic growth and the eradication of poverty.

In the world of construction, buildings have the capacity to make a major contribution to a more sustainable future for our planet. The Organization for Economic Co-operation and Development (OECD), for instance, estimates that buildings in developed countries account for more than forty percent of energy consumption over their lifetime (incorporating raw material production, construction, operation, maintenance and deconstruction). This is further assisted by the fact that for the first time in human history over half of the world's population now lives in urban environments, and this makes sustainable buildings vital cornerstones for securing long – term environmental, economic and social viability (Henderson, 2012). The pace of change means we don't have luxury of time. With urban populations' worldwide swelling by around one million people every week, there's an urgent need to come up with clever ideas that optimizes the sustainable performance of the buildings that we live and work in (Henderson, 2012).

Sustainable construction aims to meet present day needs for housing, working environments and infrastructure without compromising the ability of future generations to meet their own needs in times to come. It incorporates elements of economic efficiency, environmental performance and social responsibility – and contributes to the greatest extent when architectural quality, technical innovation and transferability are included (Henderson, 2012).

Sustainable construction involves issues such as the design and management of buildings; materials performance; construction technology and processes; energy and resource efficiency in building, operation and maintenance; robust product and technologies; long – term monitoring; adherence to ethical standards; socially – viable environments; stakeholder participation; occupational health and safety and working conditions; innovation financing models; improvement to existing contextual conditions; interdependencies of landscape, infrastructure, urban fabric and architecture; flexibility in building use, function and change; and dissemination of knowledge in related academic technical and social contexts (Henderson, 2012).

Sustainable Living Practices

Sustainable development is the development which does not compromise the ability of future generation to meet their own needs (Enger and Smith, 2006), while sustainable living is fundamentally the application of sustainability to lifestyle choice and decisions. One conception of sustainable living expresses what it means as meeting present ecological, societal, and economical needs without compromising these factors for future generations. Another broader conception describes sustainable living in terms of our interconnected social domains: economics, ecology, politics and culture.

1. In the first conception, sustainable living can be described as living within the innate carrying capacities defined by these factors.
2. The second conception, sustainable living is described as negotiating the relationships of needs within limits across all the interconnected domains of social life, including consequences for future human generations and non – human species.

Sustainable design and sustainable development are critical factors to sustainable living. Sustainable design encompasses the development of appropriate technology, which is a staple of sustainable living practices. Sustainable development in turn is the use of these technologies in infrastructure.

The summary of all these, is that if developing nations must achieve the objective of designing, building and living sustainably, the client, and his tenant must imbibe sustainable living practices like, recycling, reusing and moderation. The culture of preservation of nature and increasing green thinking indices, such promoting the conservation of nonrenewable materials like energy and water. The improvement of air quality by discouraging the setting of wildfire and similar environmental degrading activities which challenges life expectancy. The architect and other green experts should design for waste management right from source to disposal.

Conclusion

This work is not exhaustive as the topic of sustainability is an unending contemporary issue which affects not only architecture, but all facets of life. Nevertheless, it serves as a primer for a starter and reminder for others. When architects designs are functional, and other green building professionals gets it right, the client and his tenants acquires sustainable living ethics, then our environments will become green, and sustainable living will be ensured.

Recommendations

The paper recommends that architects continuously update their knowledge and where possible upgrade by acquiring trainings and attending conferences and workshops in recent knowledge in the profession. Architects must show concern over their immediate and distant environment by adhering to architectural ethics which calls for functionality in his designs, and for compliance with planning laws and building regulations as required by the local authority in which his projects are sited. Some of these architectural ethics and building regulations are listed below.

1. All buildings must originate from architects and their intern
2. Architects must refuse compromising with client against ethical practices
3. The architect should keep to planning regulations.
4. The use of open spaces and deliberate creation of vegetation (trees, shrubs and cultured grasses around buildings to help, absorbs heat, filter air and improve air flow). The trees provide shade.
5. Architects should pursue the use of environmental friendly materials and right design decisions.
6. Building heights, setbacks from adjoining buildings, percentage of site to be developed, and proper orientation of buildings on site must be ensured.
7. Town planners and architects should see each other as professional partners in pursuit of a common goal and not as adversaries.
8. Architects need to sensitize town planning authorities of the need to accommodate soft landscaping when they come up with fresh locations for development.

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