African Green Design Solutions as Vernacular Bioclimatic Architecture

Tokie Laotan-Brown

PhD Scholar in Economics and Techniques for the Conservation of the Architectural and
Environmental Heritage at the University of Nova Gorica and Università Iuav di Venezia,
Italy.

Abstract: This lifelong interaction between the cognitive and physical realms has existed
overtime. During the evolution of design solutions inhabitants adapted form and materials
to the conditions of nature; working with natural forms and climatic cycles rather than
considering forces as obstacles to overcome has hermeneutic and practical values; used by
intentional makers. The cultural identity in the inhabitant made the home, and then the
process of home-making 'made' the inhabitant; a common reward. This will include their
connection to the culture, region and environment while proposing a design solution. The
future of African design solutions, need to take lessons from the past into the future through
present resolutions.

Keywords: Bioclimatic, Design Solutions, Vernacular

Introduction

The divorce from nature by humans has been on the increase in the last hundred years and
this has been evident even in the African built environment. This paper will look at how past
African design solutions can be viewed as modern bioclimatic architecture. Historically,
Africans have built shelters with materials that can be sourced locally and while being
adapted to building technologies, as well as to the natural cycles of the environment. Cook, et
al. (2011) describes this construction of building as a response to local climate and inherently
linking the people to the local ecosystem. The introduction of environmental design that
embraces restorative ideologies can impact on landscapes and the built environment while
improving the impacts made on the natural environment. In Millen, K. (2013), she discusses
how occupants residing in an ecological and culturally sustainable environment can also
benefit from the natural elements associated with wellbeing. This shift in ideology to embrace
the outside within the inside is apparent in Kellert, (2004) which sees this paradigm as a
requirement of a new bioclimatic ethic towards the natural world.

This paper argues that planning is culturally and contextually defined, and the specificities of a place are critical in planning. Developing strategies based on indigenous vernacular forms that embody local peoples'cultures, aspirations, experiences, and values is consistent with the concept of vernacular African design solutions, which is the central theme of this paper. This paper also contributes to the green design solutions debate by emphasizing and bringing into the debate and discussion the African perspective, which is missing in green design solutions dialogue. Although the problems confronting contemporary African cities are much greater than what existed in pre-colonial African cities, it is imperative to examine the town and city structures, forms, ideas, and concepts of pre-colonial times and places, because an understanding of indigenous vernacular architecture can contribute to bioclimatic design solutions.

Our current understanding that bioclimatic architecture was an indigenous and recurrent phenomenon in West African Savannah and the Sahel dates largely to the postcolonial period. In the colonial imagination, Africa was predominantly rural in character, composed of small, undifferentiated villages of mud and thatch huts. The walled cities and towns of the Sahel (Kano province alone had 170 in 1900) were, consequently, a colossal surprise to Europeans. Frederick Lugard commented in 1902 before his assault on Kano that "I have never seen, nor even imagined, anything like it in Africa" (quoted in Connah 2000, 43). Colonial era historians and archaeologists accommodated this urban anomaly by "medievalizing" the Sahel and conceptualizing it as an economic and cultural dependent of the Islamic world. Cultural and political achievements in the Sahel were attributed to influences from the north. This diffusionist paradigm formalized the belief that bioclimatic architecture was not native to Africa.

Farther south, European administrators and anthropologists did not recognize the large, densely populated, nucleated Yoruba settlements as bioclimatic in character. Why was this? One of the main obstacles to the recognition of pre-colonial African vernacular bioclimatic architecture was that all the conceptual tools available for investigating this topic had been developed with reference to Western sequences of historical development. The bulk of the ideas on what cities are and how they have changed through time dealt with European design solution transformations from classical antiquity through the Middle Ages and the Industrial Revolution. Thus, many nineteenth – and early-twentieth-century attempts to define the term bioclimatic proceeded by constructing ideal types that identified essential features differentiating Western design solutions from pre – or non design solutions.

The archaeologist V. G. Childe constructed a list of essential features of urban civilization, including writing and monumental architecture, thereby excluding much of black Africa from consideration. The West has long thought of cities as centres of despotic power, with impressive architecture reflecting that power. It is now recognized that monumentality, while a common strategy employed by rulers of early city-states in Mesoamerica and Mesopotamia (among others), was not an inevitable accompaniment of early design solutions. The Bronze Age cities of China, for example, had no monumental architecture. Among the reasons for the lack of investment in monuments in much of Sub-Saharan Africa are lack of suitable building

materials (such as stone) in some areas and the prevalence of extensive, slash-and-burn agricultural systems that required settlement relocation after several decades, thus working against permanent installation of populations at one location for long periods. In many areas, the location of the capital landscape city shifted with every accession of a new ruler. Ecological constraints linked to a value system that conceived of space as social (rooted in kin groups and genealogical proximity), rather than as a particular physical place, produced African urban landscape configurations that looked quite different than the cities of the West.

All of this helps explain why European observers failed to recognize African towns and cities: because they did not conform to concepts of green design solutions derived from Western bioclimatic sequences. The postcolonial period has seen a reorientation of research that has exposed the ethnographic assumptions and ideological underpinnings of many of the earlier theories of urban – ism. Emphasis has shifted from what a city is (widely agreed to be a futile pursuit in view of the tremendous range of urban forms) to what a city does. We owe to geographers the important realization that urban landscapes never exist in isolation; they are always articulated with a regional hinterland. Whatever else a city may be, it is a unit of settlement that performs specialized functions in relation to a broader hinterland. The specialized functions may be of an economic nature, such as production and export of goods and services, or they have a more social aspect, such as the elaboration of power and new social institutions or the exchange of information. Urbanism thus represents a novel kind of relationship among sites in a region involving the emergence of specialization and functional interdependence. The symbiosis characteristic of the urban landscape system emerges out of the circulation of commodities essential to subsistence (food, iron used to produce food) within it. Urban landscape systems are predicated upon the exchange of agricultural surplus. Their characteristic spatial signature is a hierarchy of higher and lower order settlements in which higher order sites are larger and more populous and fill a wider range of specialized functions than lower order settlements.

In the light of the above, this paper examines the role African vernacular architecture can play in addressing green design solutions. In addition, this paper addresses the following questions. Could the incorporation of indigenous African vernacular forms, ideas, and concepts into the contemporary city-building process in Africa contribute to bioclimatic architecture? Thus, taking into consideration the urbanization challenges and problems of cities in Africa? Why have native architecture and vernacular forms been rejected and replaced with Western urban designs and architecture, and how do we promote the incorporation of indigenous local forms, ideas, and concepts into the urban development process in Africa? This paper relies on secondary sources of data for review and analysis of the characteristics of indigenous African vernacular forms; sustainable green solutions; and characteristics, conditions, problems, and challenges of contemporary African cities addressing bioclimatic architecture.

**Addressing African Vernacular Instincts in the Green Built Environment**

This paper fits alongside existing works on the understanding and merits of vernacular architecture so it is important to understand the work already done in the field. It has been recognised by many that indigenous populations find often ingenious designs for buildings to tailor them to the local climatic conditions Stevenson. (2000). Thus, design solutions have to be low energy or zero energy by the very nature of the economics of the locale. It therefore stands to reason that such techniques must also have been prevalent in African countries, and that these techniques have been long lost and forgotten. If the ideas could be rediscovered then it may be possible to incorporate such design features into contemporary structures to increase comfort levels whilst reducing energy needs.

Vernacular knowledge, to coin a phrase, extends beyond the simple building blocks of the construction to incorporate such aspects of the build as siting and orientation of the structure to work with the environment rather than against it Oliver, P.(2006). This should also be considered when looking at how the structures themselves work, and what we can learn from them. The vast majority of the work already done in this area has focussed on Western solutions for African architecture, rather than thinking about techniques that may facilitate energy reduction in the African built environment through environmentally sympathetic building design. Despite this geographical focus, pre-existing work from other parts of the world is important in understanding mechanisms for coping with climatic challenges as the world wakes up to the reality of climate change.

There is a wider question of what climate we should now be designing for in this changing environment, perhaps it would be prudent to adopt ideas from the African vernacular for modern bioclimatic design (Roaf et al, 2005)? Could this be a better methodology than relying on often power hungry technology to enhance our built environment to mitigate a changing external climate? According to Heerwagen, J. (2008) the characteristics of the natural environments that are present, ensures that human beings tend to feel calmer, more comfortable and less stressed and thereby improving their sense of wellbeing. Heerwagen, J. (2008), in her book, Psychological Value of Space- Whole Building Design Guide (WBDG), states that the work environment has been designed to separate occupants from nature, which is the modern office building where people work. The daily lives of residing in an urbanized city has ensured that working in offices with no windows at eye level, underground subway, spending evenings indoors watching tv has further estranged humans from natural regions, where villages are increasingly extended and the countryside loses is lure to residential urbanized areas (Joye, Y. 2007, Millen, K. 2013).

Africa is perceived as a paradise rich in plant and animal life; however, despite the abundance of life these areas require distinct architectural solutions to facilitate a degree of comfort to the living conditions. The climate of African countries is defined by both warmth and extremely high humidity levels. Temperatures tend to average at 24 degrees C or more under the canopy, and annual rainfall ranges from between 1.5m and 3m (WWF, 2006). Historically, the local inhabitants of African regions have had to devise structures that work in these conditions, and as a result have come up with solutions to meet their needs which are very different from the buildings of Europe. In order to facilitate passive cooling, the building has to not only be designed in a way that encourages the purging of hot air from the building during the cooler periods but also orientated in such a way as to promote heat loss Chiras, D. (2002). In structural terms, Chiras points out that the building must incorporate features to minimise both internal and external heat gain through the use of features such as light

coloured external walls, overhangs, insulation and radiant barriers. Whilst not all of these features may have been historically available to the inhabitants of Africa a surprising number of these ideas can be seen amongst examples of African vernacular housing.
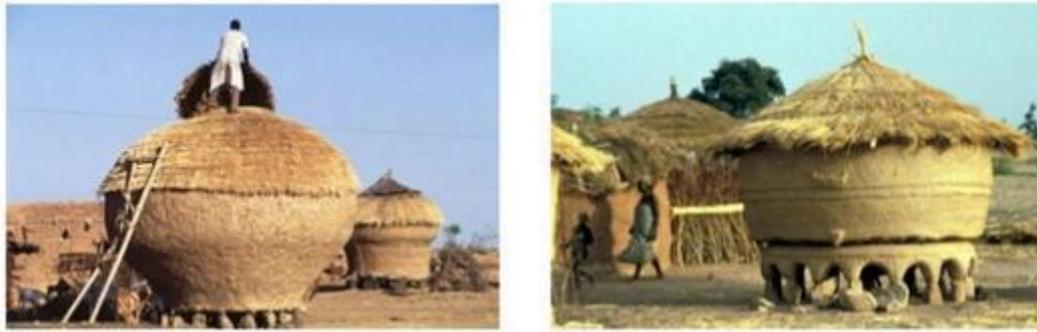
Granary-near Kankeya, Nigeria
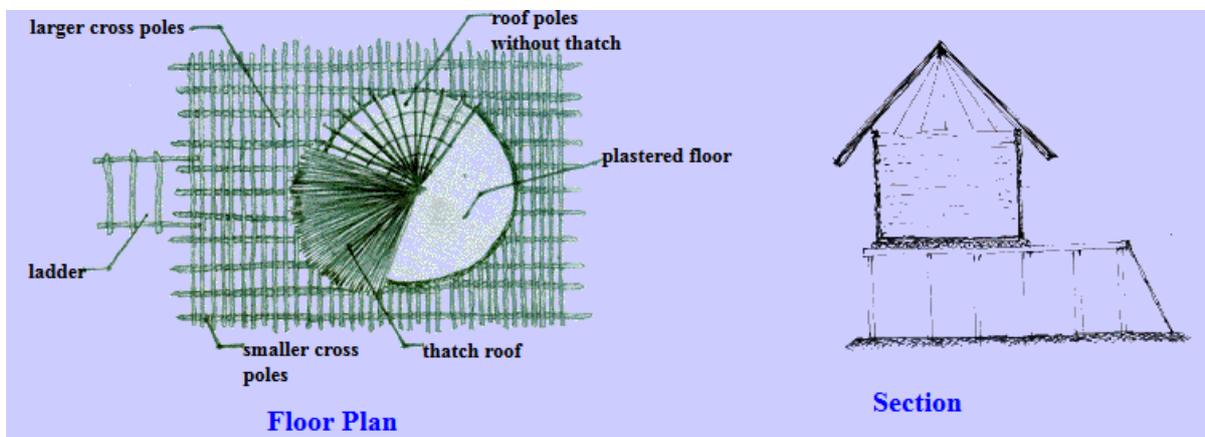
Culled from notes Laotan-Brown, T. (2013)

One of the key figures in the study of African vernacular architecture is Paul Oliver who spent time in the mid 1960s teaching at the Kumasi University of Science and Technology in Ghana. Kumasi is situated in the depths of Ghanaian Rainforest and offered Oliver the ideal opportunity to study the local architectural solutions to this hot, humid climate. What Oliver (2006) discovered was that the Asante people of the region had a sophisticated understanding of their environment illustrated by their use of giant Cottonwood trees to shade the ground below from the fierce heat of the sun, enabling cultivation below the canopy. Without the use of such cover the sun would bake the earth's surface into a concrete hard substance. This kind of cultural knowledge was something Oliver recognised not only through agriculture, but also in the dwellings both here and across different cultural groups. An example he gives of the use of this type of environmental knowledge in dwelling design and construction comes from the tropical east coast of Africa where the Swahili people build a mangrove timber framed structure and pack between the poles with mud. The gable ends of the roof space, however, are left open to promote ventilation of the structure to promote a comfortable internal environment.

Archaeology has long held the Africa as the cradle of civilisation, a place where people first made the shift from a nomadic hunter-gatherer existence of our African ancestors to a static agrarian culture Greene, K. (1994). There is a wealth of archaeological material showing this shift, and an architectural tradition stretching back from the present day into an ancient world long forgotten Hodder, (1996). Earth building has a long tradition throughout North Africa

and the Middle-East. In North Africa desertic soils consisting of a mix of broken rock and sand are just such a material Oliver, P. (2003). Not only are these materials readily available to the local inhabitants, but in performance terms they are also ideal for the harsh climate of the region, with the thick earthen walls lending the structure considerable thermal mass Biondi et al, (2006). Other materials also available locally are often incorporated into such buildings, as Biondi (2006) discovered in the Drâa Valley of Morocco.

In this area the villagers have to be prepared for flooding during the rainy season when the river bursts its banks, Biondi noticed that they incorporated a stone built lower section to the buildings to protect against both the water action during such events, as well as provide some resistance to the humidity levels that are associated with flood periods in the region. The earth is then built up onto one of these walls either as pisè or adobe bricks, with locally available palm wood used for internal floors and joists. Examples of this type of architecture exist back into antiquity within these generally arid regions, with the Arg-e Bam site in Iran dating back around 2000 years and still standing within the landscape Langenbach, (2004) illustrating the longevity of both the structures constructed in this way, but also in the architectural concept of the buildings which perform well within this climatic situation. Indeed Greene (1994) describes earth as being one of the most important ancient building materials due to both its availability and its climatic performance.

The move to building with earth, whilst being very ancient in origin, was made possible only by the shift from a nomadic hunter-gatherer society to a more sedentary agrarian based economy (Greene, 1994) with the earliest examples coming from western Asia where sun-dried bricks make their first appearance in Jericho in around 8000BC. This places the structures firmly at the early part of a period often referred to by archaeologists as the Neolithic, a time defined by the domestication of animals and the development of purposely planted crops (Hodder, 1996). The longevity of this technology by the people of these arid regions is testament to the performance of the material in providing a stable and comfortable internal climate to the dwellings Oliver, P. (2006). The materials used in these structures are not the only mechanism employed to foster a more comfortable existence for the occupants.

Green design solutions were an important architectural feature of indigenous African cities and the protection of fragile environments were critical elements underlying indigenous planning and design principles. The rural character of towns in pre-colonial Africa was the result of such practices. Gutkind (1963) revealed that the Yao tribe of east central Africa came to terms with urbanism by cultivating every plot of open and unused land within their settlements. This gave a serene impression of rural spaciousness, while at the same time providing easily accessible and fresh food to city residents. Hull (1976) revealed that, as a conservation measure, the well-spaced houses in eighteenth-century Mbanza Kongo developed by the *Bashilele* were built around existing trees to minimize the disruption of the ecological balance. And because it was a criminal offense to cut down a raphia or oil palm, builders had to accommodate themselves to the natural order of things (Hull 1976). They designed and built with nature, as McHarg (1969) terms it. Elsewhere, the Bangala towns in the present-day Democratic Republic of the Congo were bordered by rectangular patches of banana plants and double rows of palm trees laid out in straight lines (Hull 1976). In western and central Sudan, residential quarters within the oval-shaped towns were separated by green belts. These corridors of green belts were not purely for aesthetic purposes: they controlled urban spatial growth, and the farms and orchards that flourished on them supported the towns' inhabitants in times of war and famine. The Yoruba people of southern Nigeria attached great importance to gardening in cities; hence, Yoruba urban and house designs had

gardens as essential components, and this is reflected in Yoruba kings having elaborate and extensive gardens surrounding their royal palaces, referred to by Ojo (1966) as —forests enclosed within walls.

These techniques are employed to reduce the area of the building exposed to direct sunlight, and hence reduce the solar gain on the structure. However, it is noted by Asquith et al (2006) that these narrow shaded lanes have a minimal Sky View Factor, hence there is a poor exchange of heat between the space inside the lanes, and the sky. This reduces the night cooling effect on these spaces which could lead to heat build up from the day not escaping during the often cool nights experienced in these regions. In the past this was recognised and Asquith et al noticed that many traditional settlements were aligned such that prevailing winds were channelled up the streets and alleys to flush the heat from them, and provide additional cooling through convection and evaporation.

The cooling effect of evaporation was also recognised by the people living within the hot, arid regions in Africa. Dwellings in these regions are often built around a central courtyard in which a pool or fountain can be placed which has the effect of both cooling and humidifying the air as it passes over Oliver, P. (2006). Another technique often employed is to hang moistened mats over windows so the air passing through the material is again cooled and humidified by the water. Oliver notes that courtyard dwellings featuring such evaporative cooling methods have been excavated in Kahun, Egypt, and dated to around 5,000BC illustrating the antiquity of such techniques and their role in vernacular tradition. The action of air movement in providing a cooling influence on internal climate in arid regions is not the sole preserve of courtyards and alleyway, however, the wind catcher is such a development which works by capturing the cooler, faster moving air from above the settlement and transferring it into the living quarters below Asquith et al, (2006). Once again we find that the development of these devices can be traced a long way back into history, with papyrus drawings discovered in Egyptian tombs illustrating similar structures from 3,500 years ago Oliver, P. (2006), albeit in the more basic form of a wind-scoop which may be as simple as a layer of stretched fabric over a frame mounted above a building to deflect the wind down into the structure itself via a ventilation shaft. Oliver believes that the more elaborate examples of wind-catchers seem to have developed in the Gulf States of Iran and Iraq sometime around the fourteenth century.

African green design involves applying the forms and patterns of natural living systems to the creation of built environments and consumer products so that human activity sustains without harm and even regenerates the living systems of which humans are a part of (Mehaffy, M., & Salingaros, N. A. 2011, Hosey, L. 2012). Bioclimatic design include: day lighting and natural ventilation; organic forms and natural materials; visual diversity and views to nature; and access to plants, both inside and out (Kellert et al. 2011). These features are closely tied to familiar ideas of energy conservation and renewable materials. A vegetated roof, for example, which limits ambient heat build-up and reduces storm-water runoff, can also provide an urban garden and views of nature (Hosey, L. 2012). Natural ventilation can reduce cooling loads and air-moving equipment (Campbell, L. K., & Wiesen, A. 2011), while also providing fresh air. Carefully shaded glazing provides heat and light, without overheating or glare, while bestowing on interior spaces the subtle diurnal changes in the colour and quality of light (Heerwagen, J. 2008). Thermally massive walls combined with glazing that selectively filters heat and light for passive solar design as one of the principles of bioclimatic philosophy of "prospect and refuge" (Novitsky, B.J. 2009 and Timberlake, K. 2011). This directs back to early humans on the African savannah who felt sheltered at the forest's edge, while seeing prey in the distance (Kellert, S. R. 2003). What was once a matter of survival,

prospect and refuge now produces a sensation of comfort and safety? The absence of this sensation, as in buildings without views of nature, could result in anxiety and depression (Novitski, B. J. 2009).

African Vernacular Design Solution: Case study Venda Methodology- Congo to Zimbabwe.

It is believed that the Venda originally came from the Congo, and settled in Zimbabwe. The traditional Venda homestead was mainly created by the influence of the climate, topography, availability of material and the technical ability of the dwellers. According to Rapoport (1969), the house form is simply not the result of physical or any single factors but the consequence of socio-cultural factors. An example of this form seen around Africa as well is the tapered roof associated with agriculture in the region. This form is also different from the dome shaped roofs associated with nomadic livestock herdsmen. This case study will acknowledge the socio-cultural factors but mainly focus on the rationale behind the factors

Venda Hut in Mbilwe, Photo by A.M Dungan-Cronin (2005).

The huts are relatively small with simple structures. One of the reasons for this is that a large part of life is spent outdoors. The materials used for building these structures; timber, soil and grass. The natural environment is an integral part of the technical creation of the structure.
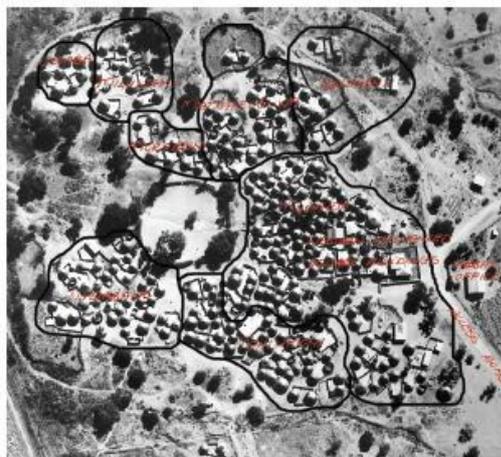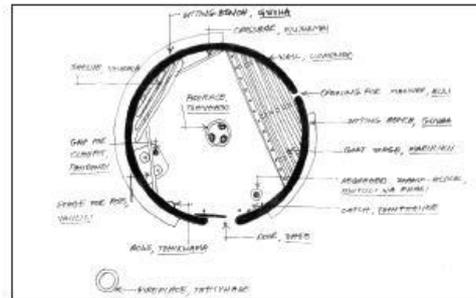

Living terraces and Living zones of the Kraal (1974)

A *Kraal* was normally fenced with planted thorn bushes. The entrance to the compound, usually at the lowest point, is directly connected with the living areas without an internal courtyard. The living hut *Nndu* and the cooking hut, *tshitanga* are placed opposite each other with the cooking hut normally at the lower level than the living hut. In front of every hut is a partitioned off area used as a yard. The head of the *Kraal* lives on the highest point of the site with his wives on the lower areas. When a very steep site is chosen for the *Kraal*, terraces are used for the siting and orientation of each hut. The terraces are supported by low stone walls.
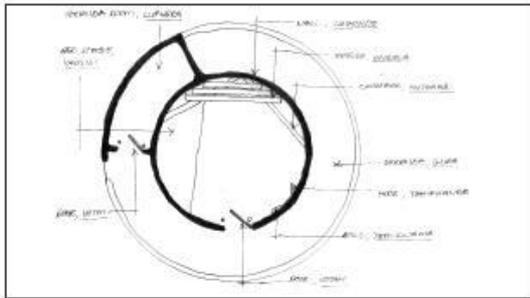
Example of a Living Hut   Example of a Cooking Hut

Low dividing walls between structures are either built of raw bricks or built-up with soil to a height of 1200mm and are roughly 200mm thick. These walls are similar to the veranda walls with a sitting bench, *gurha,* against the hut wall. 2 meters high timber poles planted in the soil are also used as dividing screens. The screens were called *mup funda.* The dividing walls between huts are never enclosed. There is always an opening of roughly 800mm and similar connecting openings to adjacent households. These low walls are built around sleeping-and cooking huts and stretch from hut to hut or at rights-angles to a terrace wall or dividing screens. The floor of the yard that is formed between these walls is sometimes finished with pot fragments. These were done for strengthening of the floor and decoration.

The architecture of the Venda is unique in the sense that no other tribe in the southern part of Africa uses a —front and back hierarchical demarcation of distinction. Due to the topography of the areas where Venda normally orientate their structures, the terms —front and back are synonymous to —downhill and uphill‖. This demarcation can be seen in the domestic unit, where the units associated with the wife or wives will be positioned downhill from those used by the father of the family. The same arrangements are observed between father and sons. The head of the family in the Venda, will have his own courtyard, kitchen and granary. Western influences in the Venda, saw the rectangular plan being adopted because of new materials and construction techniques. The Venda did not copy everything from Western culture, because they build to generate space and give them protection against the climate. The first of the structures to become westernized were the buildings of the head chief, this saw the introduction of rectangular plans and corrugated roof sheets. The Venda homestead uses a lot of timber to build. The strains that were put on the environment to keep supplying the building materials made the Venda realise the need to look for alternative building constructions. Western influences began to take a hold and eventually there was shift towards rectangular plans and building blocks.

African Indigenous green architecture can play a role in designing and achieving as bioclimatic solutions. Preference for traditional house forms, especially courtyard design (compound) architecture, which has been the predominant form of residential accommodation for both rural and urban residents in most African countries, has changed to Western villa housing designs, which now dominate large areas of African cities and towns.

The traditional multi-habited courtyard house as Andersen et al. (2006) put it is an anachronism – it is often regarded as outdated and unsuited to modern African urban life. The shift away from courtyard to villa housing in Africa is motivated by the notion of what is modern. Underlying this change is a shift in ideals, from the extended family to the nuclear family, which permeates high- and middle-income groups. This is reinforced by the standard land subdivisions and planning regulations, which favour expensive villa-style housing, and discourage the construction of indigenous compound grids with paths and lanes between houses. Indigenous compound houses, on the other hand, are relatively inexpensive to build and maintain and are affordable. Tipple (1987) revealed that one room in a compound house costs approximately one third of a room in a typical villa.

The low construction cost is due in part to the use of local building materials and simple and cheap construction techniques that are easily understood by local artisans. Courtyard houses provide safe environments for residents because the single entrance provides security by controlling who comes in and goes out. Rooms facing the courtyard provide an environment for mutual assistance and reciprocal duties of watchfulness and care in and around the courtyard and create an affirming, supportive, and safe environment. Sharing of services, which is customary and typical of courtyard houses, reduces the cost of services, making these services affordable.

Compound housing promotes high residential densities due to the large number of rooms that can be accommodated in a courtyard house. The indigenous African courtyard house is designed to make use of the elements air, light, and rain. Like the Venda, Benin's oto-eghodo and the Akan efihyia (compound houses), made extensive use of the natural elements by harnessing light, air, and water. The courtyard or the closed space in the middle of the house allowed air and light into the house, creating a humane living environment. A portion of this space is used to store harvested rainwater for use by members of the extended family. These green African designs typified McHarg's (1969) concept of ―designing with nature – they were designed with nature in mind and made use of nature. The prevailing villa houses, because of their design, minimize the use of the elements to create and ensure liveable environments, but rather rely on expensive energy-consuming devices such as air conditioners, which are not affordable to a majority of urban residents in African landscape cities.

Alternative Architecture using Indigenous Green African Design Principles

This part of the paper will explore possible designs using vernacular materials. These designs "push the envelope" of what is considered standard. In these designs, vernacular materials are predominately used with some "modern materials" used in moderation for more support. Vernacular materials which will create a unique style that is African in nature. The important point is that these materials are both green and bioclimatic in principle as well as in nature.
☐ Traditional materials such as burnt brick and thatch are durable materials if used properly. Sustainable materials are used as the primary materials and modern materials are used solely as support and to enhance strength. The following design issues will then be developed.
☐Thus, the main focus is to construct houses that are beautiful and structurally correct. Modern materials can be used to increase spans and support. The focus will be on vernacular materials and modern ones will be used modestly.

☐The larger the structure, the larger the span needs to be. Increased loads are also a factor. The increased loads can be supported by modern materials.

☐The detailing of these structures can be quite spectacular. Especially with connections, unique details could emerge.

☐ Due to increased loads and spans, the sizes of rooms can also increase, instead of having small spaces; some rooms can be quite comfortable.

☐ African architecture has strong ties to the land. Round structures and curvy lines have always existed because they create a sense of communal unity. Instead of a concrete block, which the trend is heading, the goal should be back to nature.

Conclusion

This paper addresses the underestimated radical but unnoticed societal shift, from experiencing the environment closely yet intuitively, to requiring a constant conscious effort to steering it while keeping a rational and physical distance. This shows a cost to the quality of life. Almost everything that has been built and used in traditional societies historically seems to have lost its lure (Heerwagen, J. 2008). Nature almost never repeats identical components that have a motorized geometry (Salingaros, N. A. 2010). Although monotonous repetition is a basic typology of post colonial design (Mehaffy, M., & Salingaros, N. A. 2011), it is not bioclimatic. This instantly shows this feature as an unnatural, hence anti-bioclimatic architecture. Is that why it is used so extensively? More recently, African architects have sought to integrate bioclimatic character into urban design again. But are the new designs truly seamless integrations of the most instinctive human geometries with natural ones? Or is this one more attempt at a kind of —green cloaking over the same failed western models of the modernist era or just another —branding by artists, of another dubious vision of the sustainable future?

Adopting and adapting African vernacular design solutions and architecture holds promise for achieving sustainable places in Africa. This paper concludes that indigenous African green design and associated architecture are sustainable in that they were compact– these cities emphasized dense, mixed, and multiple-use development. The use of walls, moats, and green buffers to control urban growth ensured continuous and orderly development, avoiding the scattered and leapfrog development found in contemporary African cities today. The courtyard architecture, which maximized urban space through mixed and multiple uses, promoted dense and compact urban forms. Farming within and around cities and the preservation of green spaces within indigenous African cities provided these cities with an aesthetically pleasing landscape, fresh food, clean air and jobs for city residents.

The mixing of uses and activities created vibrant, lively, and safe urban places. The active participation of the grass-roots (clan members, clan heads, family and chiefs) in planning and managing these cities helped in the maintenance of law and order and in the sustainability of African communities. This paper has demonstrated that there exist clear elements of socially, politically, economically, culturally, and environmentally sound and responsive planning principles to be derived from African design solutions and Bioclimatic architecture which can inform current urban planning practice and management in the contemporary urban development process in Africa today.

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