

Sustainability of Ageing Hospital Environment through Revitalization of Landscape Design

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Abstract

In early days, the concept of provision of healthcare facilities were borne out of needs only, but recently they are based on needs, eligibility and ability in carrying of socio-economic functions to the community- being environmental friendly, providing environmental psychological-therapy, adding value and attracting economic benefits. Healthcare providers are now aware of the new trends in ensuring sustainability- involving modifications in design programmes of infrastructure developments. Mother of Christ Specialist Hospital, Enugu, Nigeria, an aged-long healthcare facility in the country is a case study. Due to environmental dilapidation, degradation and neglect of the hospital as regards its age and present status in meeting the needs of environmental demands, the scenario portrays dehumanized environment - disorderly and untidy informal activities within the courtyards and surrounding open spaces; which possibly is putting people in the worst frame of mind. The study aims at a design of outdoor spaces that entails understanding the problems, and evolving solutions in respective areas- capturing human values, creation of comfortable and familiar environment that people can enjoy. The proposal was achieved by making the design solution valid for all groups involved- stemming the design goals from analysis of the needs, desires and values of the would be users by adopting problem oriented-approach, and applying unobtrusive measures in conjunction with other methods. The forms of each courtyards and surrounding open spaces within the buildings and beyond with their informal activities generated the form of the landscape design solution; resulting in the setup of consistent aesthetic and plan form of which their requirements fell happily into freer forms which were not forced. Thus, the design presents inviting, welcoming and cheerful scenario that people can go or stay as they wish.

Keywords: Sustainability, Ageing, Hospital, Revitalization and Landscape Design.

1 Introduction

The coming of missionaries in West Africa Sub-region in later part of the 19th Century particularly in Nigeria opened the vista for healthcare facilities. Missionaries complimented the efforts of the then colonial government in providing healthcare facilities, borne out of the needs to sustain the citizenry plagued with epidemics and numerous tropical diseases. Healthcare facilities and activities were housed in make shift shelters and under tree shades courtesy of all the year round clement weather in the Sub-region, as in figure 23, below. Mobile clinics added to the facilitation of healthcare activities. The aim then was also borne out of the vision and mission to save lives – minimizing mortality and keeping healthy the conditions of the people. In the face of the then situation adequate housing and healthy environmental conditions of healthcare facilities were of secondary issues. Notably, between the later part of 19th and late 20th centuries, missionaries established and provided the greater number of healthcare facilities and services throughout the length and breadth of Nigeria- dominated the health sector both primary and secondary. The then scenario was as a result of needs and philanthropy.

One of those popular and notable missionary healthcare facilities was the then Mother of Christ Maternity and Clinic Enugu, Nigeria. It was established by the congregation of Roman Catholic Sisters of Immaculate Heart of Mary as a dispensary in 1958. Its Head Quarters is in Onitsha, Anambra State of Nigeria, with similar facility. The concept of the healthcare facility was reducing infant and maternal mortality and morbidity. Year after year it became popular and grew in strength - ‘gasping’ to meet the demands of her yearning numerous poor population. In recent times, it has been converted to specialist hospital with 102 beds, and renamed Mother of Christ Specialist Hospital. The development was in the bead to meet up with the new trend in healthcare provision; injection of programmes to ‘capture’ the middle and high income classes. With declining average of 450 admissions per annum with different ailments, and a prolonged hospital stay of 7- 14 days depending on severity; the hospital aims at reducing the hospital stay through conducive and habitable environment, thus increasing the volume of attendance of all groups.

Designing a hospital is a most difficult and complex task, the rapid advance of medical science and the even faster progress of technology in its invasion of all spheres of human activity have made it practically impossible to plan accommodation for any branch of medical services today, which in some degree may not be irrelevant and inadequate tomorrow. The building of a hospital from inception to operation, normally takes a good many years. This means that new forms of medical treatment and technology, together with unpredictable

social, economic and political needs and policies may make almost any hospital less than up-to-date on the date of its opening. With hospital design (more than with most other types of buildings) practice varies between different countries due to climatic differences and local health needs (Nuefert, 1970).

In this context, in keeping hospitals alive, the study towed the part of the principles of sustainability. Sustainable development is an important factor of liveable environment. This, in effect maintains and enhances habitable living in existing neighbourhoods, business centres and infrastructure systems; recreational; transportation; provide a variety of housing and living environment, and conserve natural resources. Sustainable development implies forever, constant rebirth and renewal, an inexhaustible system with change in growth, expansion, production and movement in time and space; resulting in evolutionary process and constructive adaptation. But each word modifies the other. Development to be sustainable must somehow incorporate renewal that ensures the continuity of matter, resources, populations, cultures. Sustainability, to incorporate development, must allow change and adaptation to new conditions. Today, the two ideas together speak of balancing economic and social forces against the environmental imperatives of resource conservation and renewal for the world tomorrow.

However sustainable development is broadly based on people's needs, available resources and the ambient environmental conditions as advocated by the Brundtland Commission report in 1987. Douglas (2000) quoting World Commission on Environment and Development 1987, on sustainable development as defined by the later as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs". Douglas stressing that the Commission however, on this definition outlined four key principles of sustainability:

- Needs of the future must not to be sacrificed to the demands of the present.
- Humanity's economic future is linked to the integrity of natural systems.
- The present world system is not sustainable because it is not meeting the needs of many, especially the poor
- Protecting the environment is impossible unless we improve the economic prospects of the earth's poorest peoples.

In continuation to this concept by the Commission as reiterated, "we must act to preserve as many options as possible for future generations since they have the right to determine the needs for themselves". The concept of sustainable development, then meshes and encapsulates the need for preserving, enhancing, and interrelating economic prosperity, the integrity of natural ecosystem and social equity, as illustrated in figure 1.

In recent times, health facility providers are aware of the tendency of gaps between them and their benefactors in terms of socio-cultural and economic values, and meanings of their products in enhancing efficiency. With keen competitions amongst the country's health providers in improving the socio-cultural and economic values for improved performances of their products, the needs of improving over aged healthcare facilities were borne.

Due to environmental dilapidation, degradation and neglect of the hospital as regards its age and present status, in meeting the needs of environmental demands, the scenario portrays dehumanized environment - disorderly and untidy informal activities within the courtyards and surrounding open spaces; which possibly is putting people in the worst frame of mind. The situation, however, does not give the patients and visitors the feeling of welcome and cheerfulness but rather repulsion.

The study aims at a design of outdoor spaces that entails understanding the problems, and evolving solutions in respective areas; that capture human values, creation of comfortable and familiar environment that people can enjoy. The strategy involves revitalizing the surrounding environment through upgrading of existing physical facilities; new physical developments and landscaping to enhance the concept of sustainability. Re-designing the landscape is the scope of this research. Revitalization of the hospital would however add value, new impetus and vigor on the environment with salubrious effect.

The feat is achievable by making the design solution valid for all groups involved- stemming the design goals from analyses of the needs, desires and values of the would be users with regard to environmental requirements to enhance liveability and sustainability.

2 The Study Area

Enugu, the regional capital of the then Eastern Region of Nigeria, in the south- east geographical zone of Nigeria, and now the capital of Enugu State, lies on latitude and longitude, $6^{\circ} 26' 0''\text{N}$ and $7^{\circ} 29' 0''\text{E}$.

3 Reviews

3.1 Landscaping

Landscaping is a remarkable human endeavour, which brings about order out of chaotic overgrowth of weeds, shrubs and bushes, creating meaningful and pleasing spaces within and around human settlements. Natural environment on its own does not cater for man as being part of it, and also man is not part of natural ecosystem. It means that ecosystem can survive, and be complete without man; and are outside man's domain, portraying

that man cannot survive inside the natural environment without modification. Landscape concept is developed as an integral part of any scheme. Landscape design involves modification of environment for all sorts of aesthetics, recreational and development purposes forming part of development of a space. In addition, it involves basic ecological relationships with surrounding structures.

3.1.1 Landscape Elements

Landscape elements are classified into two categories, namely: hard and soft landscape in built environment; they however occur as well in natural. Appropriate blending of the two provide pleasant, cheerful and liveable environment for human habitation. Landscapes that occur in form of hard surfaces in nature or man-made are: rocks, stones, sands, walls pavements, building lines urban furniture and so on; they are regarded as hard landscape. While, water and land predominantly made of vegetation - trees, shrubs and grasses are referred as soft landscape.

According to David (2009) soft landscape can achieve a reduction of as much as 25% to 35% in cooling loads. As trees do not have a measurable effect on city temperatures at micro scale, but they do influence human thermal comfort. Adding that on a hot day, temperatures can drop by 10°C under trees due to cooling breezes produced by convective air currents, and simply by shading from direct sunlight. Green areas - lawns, shrubs, orchards by nature help in keeping the air clear, the surroundings cool and the views pleasant. They combat air pollution, to some extent control dust levels and visually enhance the buildings and habitats they encompass. Practical experiences show that when creepers crawl up the walls, and a lawn rings the building, and leafy trees shade the roof, even on a hot summer day the interior remains cool and refreshed. Conversely, a building surrounded by paved or concrete cover without vegetation around it responds quickly to extreme weather conditions. To some extent, a cold day will make such a building very cold, and a hot day will make it unbearably hot depending on construction material of the building and method of construction. Application of plantings in design is based on their nature in terms of the followings: colours of flowers and foliage, overall shape and branching patterns, texture of the tree trunks and foliage with consideration of seasonal withering – evergreen or deciduous. In addition, their root systems in terms of adventitious or non-adventitious are put into considerations.

3.2 Environmental Impacts on Life and Behaviour as it Occurs in Environment

Man is an active participant in his daily physical and social environment, and the fact lies that there is no absolute fit between whole environment and people rather adaptations are made within tolerable limits for existence in particular environment (Osefoh, 2009). However, man's behaviour is generated from continuous evolutionary process. Planning and design as tools, must provide an enabling environment to exercise freedom of choice to experience or not experience group life, and also provide for individual and group expression of human needs, desires, values and existence. In this vein, according to Hershberger (1980) "this care and solitude creates a situation in which a person appears to be needed by his surroundings". Not only does he have some control over them, but they in turn are reflection of him, and have some control over him too.

Impacts on life can be associated with physical impacts of any activity, e.g. land – development on land and socio-economic changes in population level and characteristics (Nawfor, 2006). From the fore-going, both impacts individually or collectively can generate psychological impacts- safety or insecurity. These imply positively or negatively as the case may be. Positive psychological impacts may occur as in the case of salubrious effects on people in homes, work places, social places and hospitals- with orderly environment as reported below'.

3.2.1 Effect of Landscape and Views

The importance of arts as an integrated element both in the interior and exterior designs has intrinsic therapeutic value for patients even as they approach the building, enter the reception lobby and proceed through the hallways to their rooms. In the approach to hospitals in general, the total environment can be enhanced in carefully planned landscaping, fountains, freestanding sculptures, and special lighting. Landscaping becomes even more vital when a number of more related buildings are planned for the site. Directional signage which relate well with the landscaping and the buildings is important. The intent of the overall design is to create humanized surrounding for all concerned. As important as is the effect of art on the well-being of the patient, it also has beneficial effect on hospital personnel. Experience has shown that a pleasant environment increases the efficiency and quality of work. It increases the tolerance level in meeting the pressures of very demanding duties (Redstone, 1978).

3.2.2 Behaviour as it Occurs in Environment

Behaviour as it occurs in environment may be positive or negative depending on orderly or disorderly dispensation. Recent study by the authors reported on negative psychological impacts of growth associated with physical and socio-economic development in the case of Onitsha city, the gate way of the Eastern Region of Nigeria. Onitsha, the commercial nerve centre of the region is endowed with the biggest market in West Africa; which influenced the direction of change in structures and relationship within the local community due to

uncoordinated trade and commerce. Disorderly developments of both physical and social facilities are inherent. External factors eroded traditional values and culture of the local community as a result of influx of migrants. Lawlessness, high rate of crime, indecent behaviours and insecurity plagued the city. Conversely, the city is regarded as the richest in the region.

3.3 Previous Researches

Studies report as follow:

3.3.1 Ambient Odour's Effect on Creativity, Mood and Perceived Health

Odours affect how we feel. One study tested how people function in rooms scented alternatively lemon, lavender and dimethyl sulphide (which stinks). The group was also tested in unscented rooms. Fewer health symptoms were reported in the lemon room on scented compared to unscented days. Subjects in the sulphide group were in lesser pleasant mood than those in the lavender group on both scented and unscented days (Knasko 1992), figure 2.

3.3.2 Sunny Hospital Rooms Expedite Recovery from Severe Refractory Depression

Light activates the pineal gland, located in our heads to produce serotonin, which encourages intensified emotion and vitality. On the other hand, darkness encourages pineal gland to produce melatonin, which makes us feel drowsy and ready for sleep. It stands to reason that dim rooms in the day and light pollution at night can affect sleep rhythms. One study found that light did shorten mental patient's stay. Comparisons were made of the length of stay of depressed patients in sunny rooms with those patients in dull rooms. The length of stay for depressed patients in sunny rooms averaged 16.9 days. Those in dull rooms required 19.5 days, a difference of 15% (Beauchemin & Hays), figure 3.

3.3.3 Discomforts to Environmental Noise: Heart Rate Responses of SICU Patients

According to Baker (1992) many studies found hospital sound levels exceeded recommended levels. Noise could have adverse effect on patients taking antibiotics, could be disruptive of sleep and could enhance perception of pain. Further, one remarkable study tracked patient's heart rate in response to noise. It found a significant high increase in the heart rate in the majority of subjects in response to talking inside the room. For patients exposed to sudden noise the increase to heart rate was characteristic of startle response with fairly rapid habituation figure 4.

3.3.4 View through a window may influence recovery from surgery

Ulrich (1984) advised on insistence of a room with a view because pleasant visual stimulus from natural view may enhance psychological well-being. In one study, 23 surgical patients assigned to the natural view windows had shorter post-operative stays, received fewer evolutions from nurses' notes (e.g. "upset and crying", need much encouragement'), and took fewer potent analgesics (such as acetaminophen) than the control group of 23 matched patients in similar rooms with windows facing a brick building wall, as illustration in figure 5.

3.3.5 The effects of buildings on patients and the relationship between doctors and patients in a compartment

As reported in the case of Chinnor Surgery Oxfordshire, England; investigations were carried on the relationship the patient and the waiting room of the outpatient department. Prior to the study the doctors had the notion that the waiting room had a bad effect on their waiting patients. By the views of the doctors: "this room – so characteristic, with its two rows of chairs facing each other, with the out-of-date magazines on the table in the middle, where people embarrassed and worried people opposite, seemed to put patients waiting to go into consulting room in the worst frame of mind possible". The question arose; would it not, therefore be a good idea to design something that did precisely the opposite?

3.3.5.1 Design approach

The solution started off as an open space combining waiting and circulation to see if these could be actually amalgamated. Outside, the waiting area with its freer forms and external materials, gave the patients the feeling that he is welcomed but not imprisoned, that he could go or stay as he wished. People would stay if they knew they could leave! The treatment room and office/reception areas were in that instance, able to follow the same pattern as the consulting rooms as they shared the same requirements. The form of consulting room generated the form of the other two areas, so that a consistent aesthetic and plan form were set up. Their requirements fell quite happily into these forms - they were not forced.

Feedback from patients and doctors was extremely favourable, Many patients told the doctors that they looked forward to visiting the surgery, whereas before they had to screw themselves up to do so; and the doctors were satisfied that the building was now working as a positive medical tool rather than something which merely exacerbated a patient's anxieties.

What they wanted to emphasize was that the building form, although answering certain physical needs and demands of certain activities, was mainly generated by the emotions and feelings of the users. (Aldington et al. 1980).

4 Research Method

Due to the nature of the research involving problem-oriented approach - it emphasizes the identification and descriptive analysis of problem prior to the attempt to synthesize solutions. In this vein, combination of strategies was applied: *survey and observation methods*. The concept of design process recognizes that there is considerable feedback and feed forward in the development of any architectural solution (Lang, J 1974). The information sought were: studying behaviour as it occurred in the environment, and the effect of design and of the environment on behaviour, and using them in the design.

4.1 Survey Method

Survey was conducted by personal contacts and interviews of both staff and patients for a period of 6 months, and recorded an average admission and discharge rates of 450 in- patients per annum with great number of out-patients predominantly low income class unable to pay for their hospital bills.

4.2 Observation

The study employed observation method of data collection. Unobtrusive measure of information gathering as advocated by Patterson (1974) citing Webb as a useful method for architects was employed. The measures were found most useful in the course of data collection amongst other primary sources of data. They provided valid information necessary for the design. In addition, it played a nonintrusive role in data recording; studying behaviour as it occurred in the environment- references to the documented photographs in figures: 22, 23, 24 and 25 in the text, employing observation mapping which involved tracking outdoor movements of people to different locations.

According to Darbourne & Darke (1980) the personality of the site in its physical and cultural aspects gives invention to the physical form and directions to architecture. Stressing that an exhaustive search for influences and constraint is considered essential to the design process and the physical characteristics of the site and its surroundings will almost certainly form the solution.

4.3 Physical Traces

These measures are divided into two parts: *erosion* and *accretion*. They aid in obtaining physical information with regard to environment on people and as well behavior of people on environment.

4.3.1 Erosion

Erosion is practicable and useful in planning of layouts already in use in an environment for the purposes of planning and designing walks and paths, by laying down the paths along the natural lines worn in the ground by the users of the campus; as applied in the design of the Faculty of Law, University of Nigeria Enugu Campus, Enugu (Osefoh 2009). This measure implies getting evidences on physical wears on the ground along the natural (unplanned) paths and walks used by people in a layout. On the hospital site in use, erosion is seen along the path leading from the improvised laundry area as indicted by the arrows in figures 22 and 25 below, to the open air sun drying hangers. The information obtained from this measure invariably helped in designing of walks and paths along the natural lines worn on the ground by users of the site. This however, was put in use where it did not interfere or disturb other activities on the site.

Figures 22 and 26 below show improvised open air laundry, south of the site accommodating PVC ground and overhead water tanks for services of the adjoining buildings. In addition, the open paved spaces are being used by patients, caregivers and visitors for evening outdoor relaxation when the room temperature is high. Paved low concrete walls serving as protective barriers for the septic tanks and drainages; are used as improvised seats. South view of the site shows significantly the inpatient block and part of the Administrative/ Outpatient blocks on the site. In addition, open air drying hangers, temporary make shift storage shelter for junks and movable benches and chairs were accommodated.

4.3.2 Accretion

This involves the deposits of materials, remnants of past behaviours within and around a site. It forms clear evidence of practical use of a site in its planned and unplanned states respectively. Such evidences include throwing of wastes and dumping, human excrement and unplanned storages of junk materials as in fig.22 and 25, showing physical traces.

The three concrete paved courtyards are encapsulated on the East and West axis of the site, with low walls forming improvised sit-out and relaxation areas for patients, caregivers and staff; and also serve as socio-communication grounds. By the virtue of the locations of the blocks in terms of separation of the courtyards with physical and visual links, privacy is enhanced for users. In addition, in terms of location of the blocks as regards sun direction some parts of the courtyard are shaded by the adjoining blocks providing thermal comfort in the evenings during hot dry seasons.

5 Climates

The climates of Enugu indicate that the temperature ranges between 20.5°C and 34.6°C; rainfall between 0 mm and 384.6mm; average monthly speed of wind 4.7m/s; average monthly humidity between 48% and 88% (Nigerian Metrological Agency, NIMET 2010). The sun is one of the most abundant resources in the South East zone of Nigeria which is within the warm humid zone of the tropics. The climates in the South East zone of Nigeria, present challenges of excessive heat and high humidity thereby threatening the thermal comfort of the occupants of buildings in such areas. Southeast geopolitical zone of Nigeria lies almost entirely in the deciduous vegetation of the Rain Forest belt. It is characterized by high temperature and high humidity with heavy rainfall in the wet season and intense isolation in the dry season.

6 Vegetation

Vegetation is an important natural element of landscape which occurs freely in water and on land- hills and plains. Plants are important elements of softening walls and paving, and achieving seasonal diversity. Comfort may be achieved when the bulky areas of planting holds the open spaces or paving in balance. Plants comprises trees, shrubs, flowering and herbaceous plants and grasses (ground covers). They have variety of shapes, sizes, foliage, texture and colour with different flowering seasons, seasonal changes in colour of foliage and flowers that add varying patterns of scenery. They purify the environment by absorbing carbon dioxide, sun radiation, and increasing oxygen and moisture contents in the air, in addition give shades and cools the surrounding environment.

7 Plant Selections

Selection of plant types were based primarily on their rooting habits ,and secondly on other factors such as size, colour of foliage, texture, composition, life span and seasonal conditions, and functional aspect as: shade coverage and screen, ornamentation, soil sustainability, availability, affordability and so on.

7.1 Ground Covers

Within the court yards and open spaces around the buildings, soft surfaces like lawns; ground covers of different species were used to design deferent areas as needs demanded- harmonizing the concrete structures with nature, creation of pleasant natural scenery, tidy up the environment, absorption and reduction of solar radiation to the buildings and erosion control. Low growing varieties of Nigerian species of grasses for manicured lawns were specified such as; *Emene grass*, *Bahama grass* and *Port-Harcourt grass* as in figures6, 7&8.

7.2 Shrubs

The specified shrubs were based on their functions, effects, forms, texture and colours relative to the environment. Their extrinsic and intrinsic attributes as perceived by the eye, the smell or aroma of the flowers recorded by the nose, fruits and leaves textures were also determinants in the selection. In addition, the combination of trees along with shrubs to form a passive measure for noise barriers and to help in air circulation and cooling of air around the buildings, and improving of micro-climate served as guides in the selection of types and species. Three types of shrubs were specified in terms of their nature: broad leaved evergreen, deciduous and needled evergreens to give seasonal texture and colour effects. Ornamentation played a significant role in terms ascent or focal points, shapes, trimming to enhance delightful forms of free single or combined composition of cluster of plants of hedges, screens, and low spreading varieties as ground covers. Some tropical species are illustrated in figures 9 to 14 : *Cana lilies*, *Mussaenda*, *Igor*, *Bauhinia Tomentosa*, *Common African Pear*, *Cactus*, *Bougainvillea*, *Red white roses*, *Yellow bush*, *Hibiscus*, *Acalypha Hispida*, and so on.

7.3 Trees

Selection of tree types were based primarily on their rooting habits and secondly on other factors as enumerated above. Trees with adventitious roots were deliberately avoided in areas that are close to buildings in order to avoid damages of foundations and paving. Instead, non-adventitious trees with fibrous roots (family of Palm) were selected. Those trees selected were: Coco- nut and Vegetable Oil Palm trees (being functional and economic values), Desert and Royal Palms, as illustrated in figures 15, 16, 17 &18. Those types of trees are evergreen with high coverage of shades and do not drop their leaves and litter the environment as deciduous trees do. In event of leafs withering, the stock follows suit, dries and falls in bunches with the leaves. Other trees selected that have adventitious roots were on the basis of their functional aspects in terms of shade coverage, screen, and their already existence on the site and being far off from the buildings. Such tree as the *Mangifera-Indica* (*Mango*) *Plumeria Rubra*, and *Anacardium Qccidentale* (*Cashew*) as illustrated in figures. 19, 20 & 21.

8 Site Analyses

Studies of the site were carried by analyzing landscape factors like topography, vegetation, and climate to

ascertain the potentials and constraints of the proposed development.

8.1 Topography:- It is a basic natural feature that dictates the relationship between activities on site with regard to development. In this regard, there are options of adopting the topography to an advantage in line with the design - preserving the natural features to enhance the proposal, or altering the topography to suite the development. In the case in question, the topography has a moderate slope of between 7% to 10%, and allowing an average run off of storm water.

The topography has a top loamy soil and coarse aggregate beneath possessing organic and inorganic character to support plant life and a high bearing capacity to support structural development. By the nature of the slope and the size of the sand particles, it forms a desirable fit for drainage.

8.2 Vegetation: - The vegetation of the site is that of deciduous rainforest. The existing plants- trees, shrubs and ground covers (grasses) are in association or competing for survival- offering varieties of species ranging from root types to foliage.

8.3 Climate: - The microclimates of the site are typical of the region with temperature ranges between 20.5°C and 34.6°C; rainfall between 0 mm and 384.6mm; with heavy rainfall in the wet season and intense isolation in the dry season. The average monthly speed of wind is 4.7m/s; and average monthly humidity is between 48% and 88%. The climates are like any other place within the region, presenting challenges of excessive heat and high humidity; and thereby threatening the thermal comfort of the occupants of buildings.

9 Designs

The design process involved the theoretical framework based on problem-oriented approaches; where emphases were laid on the identification and descriptive analysis of the problem prior to the attempt to synthesize solutions as mentioned earlier in the text, as illustrated in fig.26 below, *a model of designing process* (Lang, 1974). The four phases of the process include: *Intelligence*, *Choice*, *Implementation*, and *Evaluation*. The application of the model portrayed the fact that the more intelligently and thoroughly the processes were carried out, the more closely the environment provided for the needs of the users now and future in time and space.

9.1 Application

In applying the general model of decision making as it affected the design, *intelligence* was the first phase of the designing process which involved both identification and elucidation of the problem situation and the development of the programme on which the design was made. The constraints under which the solution had to operate and resources available were identified through sourcing of data. The data collected on respective open spaces on the site in terms of behaviours of the inpatients, caregivers and visitors informed the *design* phase and decisions of the individual spaces based on problem oriented solutions. These were characterized by sketch layouts relating first to programmatic and then physical elements of the space to each other. The individual spaces as in figures 22 to 25 have respective inherent problems and characters. The *choice phase* involved abstract evaluation of the alternative results of creative synthesis and the selection of the best sketch design based on evaluation for development. *Implementation* phase is limited to production of working drawings, specification and details. The final phase involving *evaluation* of completed project is kept on hold- the project has not been completed.

The landscape designs of respective open spaces were based on the character, forms, previous or existing usages, information gathered, retention and improvement of existing facilities, and injection of new ones as deemed necessary, as in figure 27 to 33.

10 Results

The design evaluation gave satisfactory result of the solution to the inherent environmental problem of the hospital. The form of each courtyard and surrounding open spaces within the buildings and beyond, with their informal activities generated the form of the landscape design solutions; resulting in the setup of consistent aesthetic and plan forms of which their requirements fell happily into freer form which were not forced.

11 Recommendations

Gardening as a transitory art should be handled with dexterity- the good ones remain, and go on forever while the bad ones do not live to the test of time. To achieve a comfortable gardening of a courtyard the following measures have to be put in place:

- Basically it is necessary to understand the ecology and inherent problems of the site in terms of its current use.
- Plants are important elements for softening walls and paving, and for achieving seasonal

diversity and comfort, the bulk areas of planting should hold the open spaces or paving in balance.

- Courtyards are hard-edged geometrical spaces, and their forms and shapes extend the design intention. In this regard, planting should come last to allow for designing; as plants give the third dimension to a two-dimensional plan.
- Courtyards should be adorned with light colours - to make them bright and cheerful.
- Courtyards should not be surrounded by tall buildings to avoid dampness and shading of trees and shrubs. Even those that thrive in shades, however may compound the problem by excluding sunlight from the space below them.

12 Conclusions

Hospital by definition is an institution providing medical and surgical treatment and nursing care for the sick or injured people. But by evolution illnesses have extended to environmental issues and impairment of healing. To that effect, increasing the scope of hospital functions; and requires appropriate processes of treatment for effective healing. Design as tool can handle those environmental illness - sick buildings and environmental syndrome as reported by researches; 'making good defect' by salvaging healing - reducing hospital stay, stresses on administration, financial, and spatial arrangements, and with improved public interaction.

Adopting the line of thought of Hertzberger (1980) which states: "*it would be something if everything we made encouraged people to become more closely acquainted with their surroundings, with each other and with themselves*". Continuing, this implies arranging things differently, so that the world, in so far as it is amenable to our influence, becomes less alien less hard and abstract, a warmer, friendlier, welcoming and appropriate place; in short, a world that is relevant to its inhabitants,

With this assertion, and in addition to the adoption of problem- oriented approach, understanding of problems of the site and use; and toeing the key principles of sustainability as guide lines for development, the success of the design resulted to the creation of functional and sustainable design; and enabling humane, comforting outdoor spaces that enhance a warm and cooperative relationship with the community. The design makes the environment inviting, welcoming with cheerful scenario - people can go or stay as they wish.

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Figure1: *Concept Of Sustainable Development*
 Source: Brundtland Commission report 1987



Figure 2: *Ambient odour's effect on creativity, mood and perceived health*
 Source: Knasko, S.C 1992



Figure 3: *Sunny hospital rooms expedite recovery from severe and refractory depressions'*
 Source: Beauchemin, K.M. and Hays 1998



Figure 4: Discomfort to environmental noise: Heart rate responses of SICU patients', Source: Baker, C.F. 1992



Figure 5: View through a window may influence recovery from surgery,' Source: Ulrich, R.S., 1984

GRASSES (GROUND COVERS)



Figure 6: Emene Grass



Figure 7: Bahama Grass



Figure 8: Port-Harcourt Grass

SHRUB



Figure 9: Muassaenda Philippica



Figure 10: Muassaenda Erytrophilia



Figure 11: Cana Lilia



Figure 12: Yellow Bush and Acalypha Hispida



Figure 13: Bougainvillea (Variegate)



Figure 14: Common African Pear

Source; Authors' Field Works 2012

TREES



Figure 15: Vegetable Oil Palm



Figure 16: Coco Nut Palm



Figure 17: Desert Palm



Figure 18: Royal Palm



Figure 19: Mangifera-Indica (Mango) Tree



Figure 20: Plumeria Rubra



Figure 21: Mobile EPI Vaccine Unit under under Anacardium Occidentale (Cashew Tree)



Figure 22: North View; erosion along the Path to Open Sun Drying Hangers



Figure 23: East View, Open Space b/w Admin/ Out Patient and In-Patient Blocks



Figure 24: South View of the Open Spaces on the Site with Open air Drying Hangers

Source: Authors' Field Works 2012



Figure 25: East View of improvised out-door activities
 Source: Authors' fieldwork 2012

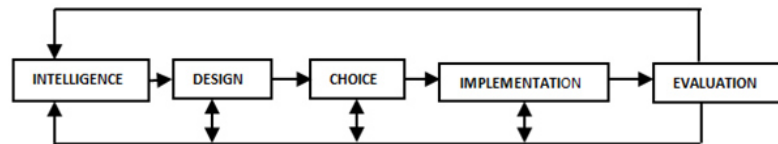


Figure 26: General Model of Decision Making (Design Process)
 Source: Lang et al. 1974

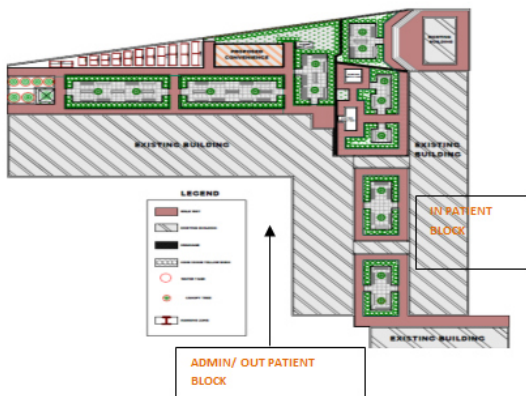


Figure 27: Proposed Landscape Design Plan
 Source: Authors' Design 2012



Figure 28: West View Court Yards in between open space



Figure 29: East View Court Yards in between open space



Figure 30: East-West Aerial View Court Yards in between open space



Figure 30: South Aerial View Court Yards in between open space



Figure 32: North Aerial View

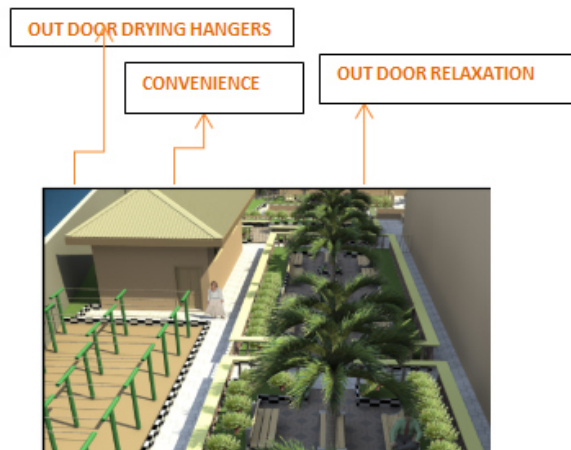


Figure 33: South Aerial View

Authors' Designs 2012

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