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Effect Of Earth Construction Acts On The Urban Environment

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Abstract: ***Research studies the effect of earth construction activities on the urban environment. Construction happening in the environment*** *have both Negative and Positive effect on the natural and built environment. The unwise use of earth's environment resource for development is opined by many researchers as a major cause for its degradation.* ***Paper discuss the global trends in the use of earth resource (material) for construction, earth construction (building); and reforms it into economic viability for use in construction.*** *Land use activities contributes to the overall development of the environment but they likewise produce negative effect on the environment. What measures can be adopted to manage these Negative? The Negative effect is principal focus of research. Paper presented in correlated parts, evaluates the negative effect of earth construction Acts on the urban environment with a view to outline their contribution to environmental hazards. In conclusion,* ***Paper discoursed that human activities create, implement, and alter social systems, positive human behavior change, therefore is required to achieve the goals of sustainability in the urban environment.***

Keywords: Building Material, Earth Construction, Urban Environment, Technology, Urban Sustainability.

I. INTRODUCTION

For generations, humans have actively engaged in earth construction activities, and these over the centuries have both positive and negative effect on the environment. Earth materials for building purpose are, known to be, the most widely used material for building construction. About half of the world's population are still living in earth buildings (McHenry, 1984; EBAA. Australia). Earth as a building material is available everywhere and exists in many different compositions. The impact of earth construction on the environment is, felt in the sourcing and the actual usage of earth materials for constructions. Historically**,** the civilization of human, started about 6000years ago, as evident from the remains of the Mesopotamians masonry heritage. The Mesopotamians used bricks, made from alluvial deposits of the nearby River Euphrates and Tigris to build their cities beside two rivers. The Egyptian pyramids that existed along the rocky borders of the Nile valley were typical examples of stone masonry. In the Eastern civilization, remains of historical masonry are the reputed Great Wall of China. Human nature which manifest in overpopulation and overconsumption of resource in the environment may be reason for major environmental threats; climate change, global warming and ozone layer destruction. Many researchers and scholars support the preposition that behavioral change is required to achieve the goals of sustainable urban living, playing a key role in helping citizens to adopt sustainable forms of living and enhance their contributions to the environment. Many social and environmental psychologist are of the view that human behaviors are rooted in social situations-institutional contexts, cultural norms, and individual adaptation are all rooted within these socio-structural network. Social structures of the environment shape rules and resources to organize, guide, and order human actions. However, human activities create, implement, and alter social systems, positive human behavior change, therefore is required to achieve the goals of sustainability in the urban environment, human

capital development and safety of all social, economic, political and environmental activities.

II. LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

A. BUILDING MATERIAL

Wikipedia (2014) defined building material as any material, which is, used for a construction purpose. Many naturally occurring substances, such as clay, sand, wood and rocks, twigs and leaves is known to be used for constructing buildings. Apart from naturally occurring materials, many manufactured products are in use, some more and some less synthetic. Many researchers are of the opinion that building materials constitute about 75% of the total cost of constructing a house in Nigeria.

B. EARTH CONSTRUCTION

Modern Earth construction is active and well spread over a vast geographic region of the Earth using many different methods of construction. The new earth buildings developing worldwide have largely utilized the good aspects of the traditional method of earth construction while adding aspects and technologies. Earth construction has also deep roots in all old civilizations, the Middle East, Iran, and the cradle of the Sumerian civilization in Iraq and the great Timbuktu empires in West Africa and had extensive use in many pre-colonial Africa. At Shibam in South of Yemen, there are more than ten stories high of cob buildings (Houben & Guillaud, 1994). Currently, unbaked earth buildings, house about thirty percent of the world's population.

C. TECHNOLOGY

Encarta (2014) defines technology as the purposeful human activity that involves designing and making products with the goal of creating and improving artifacts and systems to satisfy human needs and aspirations. Its effectiveness is, judged in terms of considerations such as efficiency in performance, reliability, durability, cost of production and environmental impact. Technology consists of a series of techniques in the devise use (for example, steel, earth, the use of reinforced concrete and glass components in building constructions). The development of technology in building skill is essentially a historical process in which one technique with one set of characteristics (local or foreign) replaces another in the light of the historical and economic circumstances of the time.

D. URBAN ENVIRONMENT

A good environment stimulates the intellectual capacity of man. A beautiful and serene environment gives an unending impression to a user. Cities and towns with over 100,000 inhabitants are projected to expand outwards by 170 percent by 2030 (Angel, Parent et al., 2010), Today, more than 50 percent of the world's population lives in urban Environment and this figure is projected to rise to 66 percent by 2050 (UN DESA, 2014). The world's urban areas, according to recent research studies by scholars and researchers accommodate more than 50% of world population; occupying only 3% of earth surface while generating 80% of global wealth. By some estimates, urban areas consume up to 76% of the earth natural resources and produce 605 of its greenhouse gas emission and 50% of its waste. Further to this, a study by Adiukwu & Akinsola (2011) opined that urbanism as a socio-cultural dynamic reflects and integrates the everyday living of the urban resident with significant effect on the urban environment. However, the study by Chen, Bing; Liu, Nianxiong (2015) affirms that though people across society have had a general awareness of sustainability principles through the ongoing education for sustainable development, its impact so far, has made limited impact on their lifestyle. The provision of good quality housing for the urban citizen is, acknowledged as an important duty for social welfare of the citizens in any nation. For this, building materials based on natural resources are often sourced and used. Examples are the use of clay for making bricks, and river sand for making cement sand blocks. The commercial exploitation of these resources often leads to various environmental hazards. For instance, if, clay mines are not properly filled up, they can, collect water, and allow mosquitoes to breed leading to multiple health problems. Extensive sand mining can lower the river-beds and allow salt-water intrusion inland. Earth (soil), can be used for construction of walls in many ways, however, there are undesirable properties that accompanies this usage, such as loss of strength when saturated with water, erosion due to wind or driving rain and poor dimensional stability.

E. URBAN SUSTAINABILITY

There is no doubt, by the by projection of mankind that the harmonious relationship between human and environmental systems in urban environment which ensures that human needs are not only met in the short term, but also continue to be met in the long term, by conserving and passing for the generations must be sustained. Many scholars and researchers agree that for human activities to be sustainable, there must be a relatively constant sustainable development to meet the needs of all people-present and future generations (Alberti and Susskind1996; Curwell and Cooper, 1998). Sustainability is often described as a multi-dimensional concept that is applied not only to the natural environment, but also, to society and the economy (Cutcher-Gershenfeld et al., 2004). The synergic collaborations between these indices drive economic growth, social equity, and environmental protection. Thus, matching these indices to a co-evolutionary perspective is one of the most significant challenges of urban environmental sustainability. To achieve sustainability goals in areas related to environment, equity and economics requires changes in planning policies, technology and the social behavior of citizens (Cutcher-Gershenfeld et al., 2004). Many scholars and researchers are of the view that concentrating on one index may result in the neglect of others. For example, a pure focus on ecological indices completely overlooks socioeconomic trends. Also, purely economic considerations

that focus on efficiency trends often neglect environmental, and cultural dimensions.

III. ENVIRONMENTAL EFFECT OF EARTH CONSTRUCTION ACT

According to World Bank (1984) report, earth construction activities in construction is a multifaceted and multifarious activity with two main classes of product-

- ✓ Buildings: housing, office, hospital, factories, etc
- ✓ Civil works: transport, irrigation, power generation etc

The environmental effect of earth construction act on the environment is, viewed from two dimensions, (positive, and the negative).

A. POSITIVE EFFECT

The building industry produce, educational, commercial, church, mosque, residential and industrial buildings. Civil engineering industries produce highways, bridges, tunnels, railway, seaport, airports etc. Apart from these direct economic contributions of earth construction, to the economy of the nation, the industries processing and manufacturing building components from earth materials also give rise to mass employment of the populace, income, and a source of shelter for people. The factories that produce and supply the construction materials also employ a large number of people. Without the products of earth construction-hospitals, schools, factory buildings, buildings for commercial activities, etc., there can be no economy for the nation.

B. NEGATIVE EFFECT

The negative effect includes large pits, a consequence of excavation and procurement. Reduction of trees from excavation activities through the clearing of, land for construction purpose, erosions and flooding and soil degradation are amongst trends discussed in the next subsections.

a. SOIL DEGRADATION

The land for agricultural purpose (soil nutrient) after excavation is, exposed to leaching. The leached soil becomes infertile, since it has become impoverished to agricultural engaging activities.

b. EROSIONS AND FLOODING

With respect to the excavation works usually engaged in the sourcing of earth materials for constructions, various potholes, and trenches after excavations are, exposed to erosion and flood. Most times during the rainy season, such locations constitute breeding ground for mosquitoes, fleas and other harmful insects to flourish with harmful health implications. The flooded area also, becomes fertile ground for small animals like frogs and toads to breed. This constitutes noise pollution with severe disturbance to the people living within the vicinity.

c. SURFACE POTHOLES AND DEPRESSION

An earth mined area, shows different sizes of potholes and depression that vary from less than 1m- about 5m. Such depression during the rainy season becomes water logged and left opens to direct insolation during the dry season.

d. UNHEALTHY ENVIRONMENTAL CONDITIONS

In view of removal of the rich top humus soil, the entire area becomes very unhealthy to support plant growth. The direct insolation promotes the barren nature of the tropical soil.

e. ECOLOGICAL IMBALANCE

The result of earth mining activities is the result of ecological imbalance. The destruction of any of these leads to imbalance and is a common feature of any area where soil, sand, and gravel are, excavated in large quantity.

f. DIRECT INSULATION

An excavated land is, exposed to direct insolation from sunlight. The entire area is, exposed to excessive evaporation. Thus, the soil formation becomes very slow; this renders the land almost ineffective for crop and livestock farming, and some other economic exploits.

g. DESTRUCTION OF VEGETATIVE COVER

The excavation of soil for construction leads to the destruction of vegetable matter that can help prevent soil erosion, soil leaching, and wind erosion.The next section and subsections studies the sustainability of earth as a tool for efficient construction and suggest ways of optimizing it usage and adoption for a healthy and better environment.

IV. SUSTAINABLE EARTH CONSTRUCTION

Earth construction activities refer to a wide range of activities, involving the use of earth material in various forms for purposes such as building work, airports, railways, highways, bridges, dredging harbors, dock-work, sewage treatment facilities, tunneling and demolition activities. These activities, thought beneficial are, major contributor to negative environmental impacts; if not handled with foresight. Implementation of sustainable construction often focuses on improving environmental performance across a project's lifecycle and should identify the following.

A. IMPROVING THE LIVING ENVIRONMENT

In the project design stage, consideration should be given in choosing non-deplorable and recyclable construction materials, for example, prefabrication and reusable formwork, thus to reduce environmental impacts in implementing construction projects. By these, Air quality can be, improved in the living environment. The implementation of this scheme

aims to provide healthy, safe, and pleasantly built facilities and surrounding environments.

B. ENVIRONMENT - FRIENDLY CONSTRUCTION METHODS

On-site construction activities cause air, noise, water, and waste pollution. The Nigeria government trends ordinances and regulations to control air; noise, water, and waste pollution .The government also introduced construction waste disposal charging scheme to promote reduction of construction and demolition waste and use of recycled construction solid waste and components. Strict adherence to ensuring an environmental friendly earth construction exercise should also consider adopting an environmental friendly approach in the construction methods used in earth buildings.

C. ENERGY SAVING IN BUILDING LIFE CYCLE

All around the world, countries like the US, UK and many European Union government encourage reducing energy consumption in the building life cycle of construction by promoting the use of building materials sourced locally with less embodied energy, which is the energy used for producing construction materials and components. An example is to promote the adoption of locally sourced materials, thus reducing energy consumption involved in transportation. Energy in the natural environment exists in various typology such as natural gas, crude oil, coal, and water. These fossil fuels and minerals are deflectable and often converted into other forms of power such as electricity. In turn, this energy is, used to extract and transport raw materials, to process materials, to fabricate construction components, to operate construction equipment and plants, and to operate built facilities.

V. ENVIRONMENTAL ISSUES OF EARTH CONSTRUCTED BUILDING

A. DURABILITY AND RESISTANCE

The main drawback of earthen material is the need for continuous maintenance and the lack of durability and resistance to water. Most researches done in this area has always focused on processed durability or strength (Adiukwu, F.O. (2011). All aspects should be, considered to produce sustainable, durable, safe, and environmental friendly homes and buildings. However, earth construction components suffer from shrinkage cracking, low strength, and lack of durability. In addition, most earthen materials are unsuitable for homes of more than two stories, as they are unable to carry the load of the upper walls. The lower walls would need to be thicker than the upper walls in the same building. The challenge of modern and new requirements, the need for sustainable low cost buildings to house people and the lack of knowledge in this area justify the need for more research to be, focused on the strength and durability of earth building wall component.

B. RAINWATER

There are also problems of rainwater penetration in buildings that need to be, solved to increase durability, for example, the problem of rain penetration in buildings. According to Jefferson, rain penetration results in condensation of water vapor on cool surfaces leading to damp walls (Ritchie, 1960). Damp walls have become more common since the1920s. This is because of changes in materials use and construction methods (Crawford, 1978). In spite of all the advantages of earth material, it is still unsuitable for use in many countries around the world; this, mainly is attributed to the setbacks of this material for construction exercise.

C. UNDERGROUND WATER

Water from the ground, erodes the bases of earthen walls, affecting them to crumble and fall away quickly. Since water is, the main enemy of, all earthen construction (McHenry, 1984; Farnsworth, 1999), walls should be, sealed, to prevent all kind of moisture attack: either it is from an external source (rainfall, soil humidity, ground water) or internal source (used water and pipes). In view of this, several trends have to be, considered like the weakness of earthen blocks against the water effects and the need for this cheap material in other areas that are not arid but are wet and cold.

VI. BENEFITS OF CONSTRUCTION TO THE URBAN ENVIRONMENT

Promoting the urban environment for sustainability, particularly working with nature, leveraging on density, clustering of competitiveness and optimizing infrastructure, contributes in no small measure to the attainment of physical, health and psychosocial need of a people (UN-HABITAT, 2012). Ecofriendly construction can provide the unifying framework for creating a continuum between the green elements of urban landscapes. Ensuring a sustainable future for cities requires urban forestry, urban agriculture, horticulture, bio diverse gardens and parks, public space, bioengineering, bio filters, phytoremediation, and other disciplines to be strategically integrated. The earth construction, has evolved in several forms over the centuries and have varied applications around the world. This is especial so, in the last 30 year in developed nations like USA, Canada and Australia, and also has been utilized in varying capacity in developing nations like Yemen, Sudan, India, Uganda and Nigeria to solve housing needs. According to Adiukwu (2015), Housing is an important means of man's survival, as it also stimulates the social stability, work efficiency, and the development of individuals in the community. Buildings made from earthen materials can be a way towards sustainable management of the earth's resources. The main reason for using earth is its excellent sustainability characteristics and the efficient use of limited resources, minimizing pollutions and waste and low carbon emissions. Earth construction materials are cheap, abundantly available, and easy to use for building purpose.

A. EARTH BUILDING

Mud brick, also referred to by the Spanish name of 'Earth' which means mud or puddle earth, a product from earth material, generally refers to the technique of building with sun-dried mud blocks in either load bearing or non-load bearing construction. Mud bricks are becoming increasingly commercially available in a range of stabilised and non-stabilised bricks and blocks. Earth Building has several advantages and includes:

- ✓ Low in embodied energy
- ✓ Utilisation of natural resources and minimal use of manufactured products
- ✓ Good sound absorption characteristics
- ✓ High thermal mass
- ✓ Acclaimed ability to "breath"
- ✓ Easily manufactured and worked
- ✓ Flexibility in design/colour/surface finishes
- ✓ Good thermal Insulation properties

VII. CONCLUSION

A common feature of urban development with respect to technological activity, no matter what outcome is in mind, is the ability to design and plan for present and future needs. Urban environmental sustainability relies on several forms of investment and their mutual relationships, plus monetary, natural resource, human, cultural and social capital (Munda, 2004). Thus, the various adaptable use of earth for constructions has varied effect on the natural and built environment. These effects are wide-ranging and dimensional in result -*negative* and *positive*. Thus, based on the principle of using research (or evidence) to inform design/development, this will foster a transition of the construction sector and lead it towards sustainable development (Chen 2015.) For the effective maximization of our environments' resources, many researchers and scholars are advocating the emphatic minimization of the negative effect and consolidating on the positive effects. Successful community involvement in a better environment requires material and technical resource therefore efforts in resource-technology, material and energy channeled towards urban sustainability in a dynamic synergism is an *open option need* for positive development.

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