

SOLID MINERAL RESOURCE DEVELOPMENT IN SUSTAINING NIGERIA'S ECONOMIC AND ENVIRONMENTAL REALITIES OF THE 21ST CENTURY

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ABSTRACT

Nigeria had relied solely on her oil wealth at the expense of all other naturally endowed agricultural and enormous mineral resources that abound every landscape of the country. The worldwide economic melt-down that was experienced by the third quarter of 2008 in the United States of America coupled with the slide in foreign earning from crude oil export revenue at the international market, leaves a lot to be desired once again on Nigerian monolithic economy. This study attempts to take a general over view of ceramic raw materials based on the researcher's field exploration, exploitation, and studio experimentation on these materials that were accessed for the purpose of producing products that satisfy aesthetic, functional, and technical purposes which have direct or indirect impact on sustainability of the environment. These are in the area of generating wealth from exploitation of solid minerals like kaolin, ball clays, feldspar, quartz/silica sand, calcium carbonate, talc, and bentonite, converting ceramic waste products to wealth after processing it into crushed power. Thus the manufacturing of structural ceramic products such as clay roof tiles, sanitary wares, wall and floor tiles, electrical insulators, sewage pipes, and burnt bricks, are basic components that contribute significantly to housing provisions in the built environment. The mineral exploitations and industrial establishments that are solid minerals based, in no small way, contribute to the socio-economic transformation of the environments through job creation. This is made possible by taking from the environmental local resources and paying back, by adding value to them through better standard of living.

Keywords: Unreliable Oil Revenue; Abundant Under Utilization of Solid Minerals; Capacity Building; Environmental Sustainability

INTRODUCTION

Environment by definition from Encarta dictionary simply means all the external factors influencing the life and activities of people, plants, and animals. It is about nature that comprises the ecosystem, earth, and the world in general which is bordered upon by external influences of human activities. Nigeria has a vast land mass which is so endowed with both natural (solid mineral, agricultural resources, and aquatic activities) and human resources, that is, capable men and women with vast knowledge in various disciplines. Before independence a lot of economic activities of the people are concentrated on agric-allied products. Northern Nigeria produces a lot of groundnuts, cotton, yam, beans, and grains. Generally, Western Nigeria is known to produce Cocoa, Coffee, and timber while the Eastern Nigeria is the major producer of palm oil, rubber, and timber. These activities were the basis of economic development of the regions in Nigeria after independence.

The discovery of oil in the Niger Delta area shortly after Nigerian independence in 1960 marked a new dawn of economic boom which led to gradual shift from regional self sustaining economic activities from Agriculture, to sharing of derivation from crude oil income among states that comprises the Nigerian's federation. This has been the main sustainable developmental source the country depends on for revenue earning all through the 1960s to date. The dwindling world market price of crude oil makes it obvious that for Nigeria to be able to join the twenty developed economy by the year 2020, the oil revenue must, as a matter of urgency, be used to develop the other sector of the economy such as agriculture, manufacturing, and infrastructure.

The world is currently undergoing a global recession which started in 2008 and has affected income generated from crude oil import by Nigeria. This is coupled with the crises in the Niger Delta in which the restless militant's youth continue to attack installations of the multinational oil companies operating in the area. Having critically assessed the potential danger this situation could pose to the economy of the country, this study strongly advocates for an alternative means of sustenance through exploration and exploitation of natural resources that the country is largely endowed with, especially in the area of ceramic raw materials such as kaolin, ball clay, feldspar, quartz/silica sand, calcium carbonate, talc, and bentonite. To exploit these minerals, two important themes are expected to be taken into consideration, that is, environmental protection which will not preclude economic development and economic development that must be ecologically viable on the long run. The subsequent discussion considers some concepts on sustainability, environment, and earth minerals used for the production of ceramics products.

ENVIRONMENTAL SUSTAINABILITY

In a broad sense, sustainability is the capacity to endure. In ecology the word described how biological systems remain diverse and productive over time, for humans, it is the potential for long-term improvements in well being which in turn depend on the well being of the natural world and responsible use of natural resources (Kennedy, 1963). It is applied to every facet of life from local to global scale, wetland and forests, chemical cycles and ecosystem. Since 1980s human sustainability according to United Nation General Assembly (1987) has implied the integration of economic, social and environmental spheres to meet the need of the present without compromising the ability of future generations need. This could be through re-organized living condition such as eco village, eco municipalities, green building and sustainable agriculture, renewable energy, and sustainable architecture.

The idea of sustainable development can be viewed as inevitably depleting or degrading the environment because there is no how a development will not have adverse effect on the environment (Redclif, 2005). World Bank (1994) emphasizes that in valuing the sustainable environment, social and economic factors with an overlapping effects that are mutually reinforcing must be taken in to consideration. In 1987 the United Nation Commission on Environment accepts a development that must be sustainable by meeting the needs of the poor while not increasing environmental problems. It is based on all these premises that this study hinges its discussion on how ceramic raw material sourcing in Nigeria is expected to impact positively on the immediate environment.

CERAMICS RAW MATERIALS IN NIGERIA

The exploitation and processing of ceramic raw materials are enough to influence development and capacity building among the local miners around the communities where they are located. The minerals as stated below from Raw material Research and Development Council (2003) and the Raw Material Research and Development Council (2008), indicates the originating states and locations of Feldspar, Kaolin, Quartz, Limestone, Silica sand, Talc, ball-clay, and bentonite. (Refer to Table 1-8)

Table 1: Feldspar Deposits and Location in Nigeria

STATES	LOCATION
Ogun	Abeokuta
Ekiti	Ijero-Ekiti
Osun	Oshogbo, Ilesha, Ede, Ipole, Iwo
Plateau	Bassa, Mangu, Pan shin, Langtan North, Jos North/South,
Niger	Shiroro, Kontagora, Borgu,
Kogi	Osara, Lokoja, Egbe, Okene,
Nasarawa	Akwanga, Kokona, Nasarawa,
Borno	Gwaza, Shani, Kwajaffa, Bakin Kasuwa,
Adamawa	Maiba Guyuk
Edo	Etsako East, Etsako central
Kebbi	Zuru, Yawuri, Kaoye
Katsina	Faskari, Batsari, Kurfi,
Taraba	Jalingo, Yorro, Baissa, Ussa.

Source: Raw Materials Research and Development Council (2009)

The estimated reserves in metric tonnes are not available except for Ekiti State which is 3.76 million. It has industrial relevance in the glass and ceramics industries, used as filler in rubber and plastic products.

Table 2: Sources and Locations of Kaolin in Nigeria

STATE	LOCATION
Cross River	Alige, Betukwe, Mba, Behuabon,
Akwa-Ibom	Ibiaku, Ntok Opko, Mbiafum, Ikot Ekwere,
Abia	Umuahia South, Ikwuano, Isiukwato, Nnochii,
Enugu	Uzo Uwani, Nsukka South, Udi, River-Oji, Enugu North,
Imo	Ehime, Mbano, Ahiazu, Mbaise, Orlu, Ngor Okpalla, Okigwe, Oru,
Benue	Apa, Ogbadibo, Okpokwu, Vandikya,
Anambra	Ozubulu, Ukpok, Anyamelum, Ekwusigo, Nnewi South, Ihiala, Njikoka, Aguata,
Ondo	Abusoro, Ewi, Odo-Aye, Omifun,
Ekiti	Isan-Ekiti, Ikere-Ekiti,
Nasarawa	Awe, Keffi,
Ogun	Ibeshe, Onibode,
Kogi	Agbaja,
Niger	Lavum Gbako, Bida, Patigi, Kpaki,
Kaduna	Kachia,
Plateau	Barkin-Ladi, Mangu, Kanam,
Bauchi	Ackaleri, Genjuwa, Darazo, Misau, Kirfi, Dambam,
Yobe	Fika(Turmi),
Borno	Maiduguri, Biu, Dembua,
Edo	All parts of the State,
Delta	Aniochia South, Ndo Kwu East,
Osun	Irewole, Ile-Ife, Ede, Odo-Otin, Ilesha,
Katsina	Kankara, Dutsema, Safana, Batsari, Ingawa, Musawa, Malumfashi,
Kano	Rano, Bichi, Tsanyawa, Dawakin-Tofa, Gwarzo,
Kebbi	Danko, Zuru, Giro, Dakin-Gari,
Oyo	Iwo, Alakia,

Source: Raw Materials Research and Development Council (2009)

The estimated reserves of kaolin in Benue, Anambra, Ondo, Ekiti, Nasarawa, and Katsina are in hundreds of million tonnes used in ceramics industries, fillers and extenders in paper, paint, cosmetics, rubber and pharmaceutical industries. Plateau state has kaolin at large commercial exploitation while in Katsina state Kaolin are utilities by the kaolin processing plant in the communities.

Table 3: The Location of Quartz deposits in Nigeria

STATE	LOCATION
Ebonyi	Ohaozara, Abakaliki,
Ekiti	Idao, Iroko, Aiyegunle, Efon-Alaaye, Okemesi,
Plateau	Mangu, Pankshin, Kanam, Langtang North,
Niger	Duku-Rijau, Gurara,
Kogi	Okehi, Okene, Egbe,
Katsina	Faskari, Bakori, Kurfi, Funtua,
Kebbi	Danko, Washgu,

Source: Raw Materials Research and Development Council (2009)

The estimated reserves of quartz in Ekiti State are put at 23.817 million metric tonnes. It is used for Gel-Silica as catalyst/desiccants, precipitated silica.

Table 4: Sources and Locations of Limestone Deposits in Nigeria

STATE	LOCATION
Cross River	Mfamosing, Odukpani, Uwet, Akpa, Okranibang.
Akwa Ibom	Obotime
Imo	Okigwe
Abia	Arochukwu, Ohafia, Bende.
Anambra	Njikoka.
Ebonyi	Abakaliki, Ikwo, Ishielu, Afikpo North, Ohaozara, Ohaukwu.
Enugu	Nkanu East, Agwu, Aninri
Benue	Ado, Apa, Gboko, Guma, Gwer West, Katsina-Ala, Konshisha, Makurdi, Oju, Okpokwu, Ushongo.
Ogun	Ewekoro, Shagamu
Kogi	Ajaokuta, Osara, Ekinrin-Adde, Itobe, Jakura
Nassarawa	Awe
Gombe	Gombe, Yamaltu-Deba, Funa-Kaye, Nafada.
Yobe	Yobe: Garin Ari, Turmi(Fika) Deda, Kwayaya (Fune).
Adamawa	Guyuk, Shelleng, Ngurore, Numan.
Borno	Yadi-Gilan (Danboa)
Edo	Akoko-Edo, Owan East, Owan West, Etsako East, Etsako Central, Etsako West.
Kebbi	Jega

Source: Raw Materials Research and Development Council (2009)

Limestone can be located at Cross-River, Ogun, Imo, Abia, Anambra, Ebonyi, Enugu, Benue, Ogun, Kogi, Nasarawa, Yobe, Adamawa, Borno, Edo and Kebbi States. It is used in Cement Industries, as lime fertilizer flux in glass ceramics, iron, and steel industries.

Table 5: Sources and Locations of Silica sand Deposits in Nigeria

STATE	LOCATION
Cross River	Ikrom, Ibine Oban, Mfamosing, Okorotong Hills, Akamkpa, Obudu Akwa-Ibom: Iwuo Ukem, Ibeno beach, Mbo
Benue	Buruku, Gboko, Guma, Katsina Ala, Vandeikya, Agato, Logo
Abia	Ukwa East, Aba North, Isiala-Ngwa North, Isiala-Ngwa South, Ukwa East, Ukwa West.
Imo	Ihiagwa, Obinze, Isu, Njaba, Obowo
Enugu	Enugu-Ekulu, Igbo Eze North and South, Isi-Uzo, Nkanu East, Uzo-Uwani.
Lagos	Apapa, Badagry, Epe, Eti-Osa, Ibeju-Lekki, Ikeja, Ikorodu, Lagos Island, Ojo.
Ondo	Igbokoda, Atijere, Akata-Agbala, Zion Pepe, Aboto Agerige, Ese-Odo Ikare, Ilaje
Niger	Gbako, Gurara, Lavun, Mokwa, Katcha, Muya, Wushishi, Bida
Nassarawa	Lafia, Doma, Nassarawa.
Kaduna	Kaduna
Gombe	Yamaltu-Deba, Akko, Dukku
Yobe	Ngeji (Fika), Damaturu, Jakusko, Karasuwa, Nguru, Tarmuwa, Geidam
Borno	Dikwa, Gwoza, Maiduguri, Jere, Monguno, Kaga, Nganzai, Mobbar, Magumberi, Mafa, Kaga, Kukawa, Kala/Balge, Guzamala, Gubio
Delta	Ughelli North, Ughelli South, Aniocha-North, Aniocha South, Bomadi, Burutu, Ethiope-East & West, Ika-North-East, Ika South, Isoko North, Isoko South, Ndokwa-East.
Bayelsa	Sagbama, Southern Ijaw, Yenagoa
Katsina	Zango, Baure
Kano	Danbatta, Makoda

Source: Raw Materials Research and Development Council (2009)

Silica sand is found in Benue with over 250 million tons; while in Ondo has over 200 million tons. It is used in the production of glass, fused silica, and as fillers in automobile tires, rubbers, and in footwear soles.

Table 6: Source of Talc in Nigeria

STATES	LOCATION
Cross-River	Obudu,
Osun	Ile-Ife, Ila, Ilesha,
Ekiti	Ijero-Ekiti,
Niger	Rafi, Shiroro,
Kaduna	Zonkwa,
Kogi	Isanlu,
Oyo	Iseyin.

Source: Raw Materials Research and Development Council (2009)

It used as cosmetics, for ceramics and tire manufacturing.

Table 7: Locations of Ball Clay in Nigeria

STATES	LOCATION
Cross-River	Appiapumet and Ofumbonghaone, Ogurude, Ovonum
Akwa Ibom	Nkari, Nlung, Ukim, Ikot-Etim, Eket-Uyo, Ekpere-Obom, Ikot-okoro, Ikwa
Benue	Katsina Ala, Otukpo, Buruku, Gwer West, Gwer, Makurdi
Ebonyi	Ohaukwu, Ezza North, Abakaliki, Ezzi, Afikpo South, Ohaozara
Abia	Isikwuato, Ikwuano, Umuahia Bende, Arochukwu
Enugu	Enugu, Isi-Uzo, Uzo-Uwani, Oji River, Udi
Ekiti	Ara-Ijero, Igbara, Ado, Orin
Ondo	Erusu Akoko, Ikale, Ode-Aye, Ute Arimogija, Ifon
Ogun	Bamajo, Onibode
Plateau	Bassa, Barinkin-Ladi, Mangu, Kanam, Langtang north
Niger	Lavun, Gbako Suleja, Minna, Agaie, Paikoro
Kaduna	Kachia, Maraba-Rido, Farin-Kassa
Kogi	All over the state
Rivers	Etche Ikwere
Kano	All over the state
Delta	Ethiope East, Isoko South, Ndokwa, South/East/West Okpe, Sapele, Ughelli South, Warri North/South.
Niger	Agaie, Bida, Lavun, Mashegu, Murya

Source: Raw Materials Research and Development Council (2009)

Ball Clays can be found in almost all states in Nigeria with Enugu, Ekiti, Ondo, Ogun, Niger, and Kano as prominent places where it is used in the production of burnt bricks and ceramic products.

Table 8: Locations of Bentonites in Nigeria

STATE	LOCATIONS
Cross-River	Ogurude
Akwa-Ibom	Itu,
Ebonyi	Ohaozara,
Abia	Arochukwu, Umuahia, Bende, Isiukwato, Ikwano'
Ananbra	Akwa South,
Gombe	Akko, Gombe, Yamalta-Debba
Adamawa	Mayo-Belwa, Guyuk, Mbi, Gombi
Yobe	Gujba,
Borno	Ngala, Marte, Mongunu, Gamboru Ngala, Dikwa,
Edo	Akoko-Edo, Owan East, Owan West, Etsako East, Etsako Central, Etsako West (L.G.A.s).

Source: Raw Materials Research and Development Council (2009)

It is used as drilling mud in petroleum industries and gas exploration, iron- ore, palletizing, foundry, sand bonding or molding, ceramic additive for plasticity.

Ceramic bricks and other ceramics sanitary ware productions had increased the capacity building of the stakeholder involved in the processes as the demand for housing provision continue to be in high demand. Housing provision had been one of the demanding needs of the people within the built environment due to increasing population growth and un-correspondent availability of houses to meet such needs. In the late 1970s and 1990s when the cost of operating industrial kilns using black oil were still cheap, the use of burnt clay bricks happened to be one of the cheapest building materials that sustain the built environment. The burnt bricks according to Kashim (2000) had the advantage of providing warmth when the outside is cold and vise-visa when the outside is hot. (See figure 1). The bricks have a great resistance to fire outbreak, giving it advantage over cement bricks. These resources are still largely available in various parts of Nigeria where ball clay are mined but the cost of manufacturing is very high now as a result of the increase in oil price internationally. The saving grace could be through the enforcement of the 1979 ban placed on gas flaring by Nigerian government to protect the Niger Delta area of the country. That is by converting the continually flared gas to usage for industrial source of energy to operate the tunnel kilns used in firing the clay bricks. This would encourage many establishments of both medium and small-scale brick making industries in the clay rich environments, which might make cost of procurement of bricks for the building of houses cheaper and create more employment, which also continue to sustain capacity building within the built environment.



Fig. 1: Alagbaka shopping arcade built with Ire Burnt Brick, Akure, Nigeria (Photo <c> Adedapo Adebayo.)

Clay has sustained the Nigerian environment significantly. Landowners in which the clay has been mined collect monetary royalty for any load of truck collected from their land. Clay is also used in making solid bricks and mortar for the construction of buildings in rural settlements. The worker involved in the making of this bricks and construction of the buildings are rewarded adequately in the charges for their skilled labors. Clay, stabilized with a small percentage of cement is currently being adopted in the built environment as demonstrated in the construction of the electronic testing center at the Federal University of Technology Akure, Nigeria. (See Figure 2)



Fig. 2: A 500 capacity Electronic testing center at The Federal University of Technology, Akure, Nigeria Photo <c> Oluwafemi Adelabu.)

In Thailand a lot of women are involved in the production of burnt bricks using different types of wooden kilns and has been a major source of income for them. Nigerian women can also be so empowered considering the quantity of ball clays and wood available for such venture. In the process of replacing the tree logs from fallen

trees used for kiln firing, other women can be empowered through paid labour to plant plenty of trees as replacement so that the ecosystem would not be threatened. These future mass planting of trees through government assisted programs on tree planting by Ministries of Agriculture and Natural Resources in various states of the country, can further act as a source of energy for ceramics kilns of low temperatures in the future.

Traditional pottery making abounds in a lot of Nigerian traditional society in spite of the adoption of metal and plastic materials. The place of traditional pottery vessels still plays prominent roles in certain aspects of Nigerian life. It is still quite possible to encourage the local potters to adopt the modern methods of using the potter's wheel, glazing of ceramic wares, and firing them in the kiln. This will allow for maximum capacity building of the potters efforts through harnessing the natural mineral endowment within local communities where they are located. Examples of such traditional pot making communities are Zaria, Ilorin, Okigwe, Afikpo, Ipetumodu, Isan Ekiti, Ire-Ekiti, Abuja, and Egbado. Some of the local potters use clay for ornamental embellishment in form of traditional beads fired at low temperature and enhanced with color oxides. The beads command high cultural value among the traditional customary setting, especially among the high chiefs, traditional dancers, ritualists and in recent times used as object of adornment among the young folks in Nigeria. (See Figure 3)



Fig. 3: Traditionally handcrafted ceramics beads necklace made of terra-cotta, 2008. (<c> O. O. Fadairo)

Large scale industries in Nigeria such as the Modern Ceramics, Umuahia, Royal Ceramics, Suleja, Abeokuta Ceramics, and Inter-Links Technologies. Ogba-Lagos have utilized local raw materials to produce sanitary wares, dinnerwares, technical, and structural ceramics. These products according to Kashim (2002) have contributed to the aesthetics of the built environment. The sanitary products such as sewage pipes and sanitary wares are used for convenient disposal of human waste, the electrical insulators have allowed effective distribution of electricity, the burnt bricks, clay roof tiles, wall, and floor tiles have been extensively used in the building construction industries in Nigeria. The introduction of mosaic tiles have been used as an alternative

surface treatment of walls as a replacement of paints to contend with the impact of tropical weather which leads to fast wall depreciation of painted walls. This is usually as a result of long periods of heavy rain fall and severe periods of a hot season, which are intensive on surface of architectural edifice.

RECYCLING OF CERAMIC WASTE

Industrial environments are usually economically viable places where materials that are not of value at the initial state are worked on and made in to objects of treasure. A lot of waste is generated while producing ceramic wares in the factory, which are usually referred to as rejects. These wastes are from finished products that have such deficiencies that would naturally make them unacceptable in the market because they could constitute health risk. The wares usually have such fault like internal cracks, dunting (cracking of pottery caused by stresses which form during firing and cooling) and bloating. The production moulds which are made of plaster of paris, usually under normal circumstances, expire after 90 product casts, though some are made to go far more than such tolerable limits. The expired moulds in most instances are dumped after they may have expired. These broken ceramic wares and the expired plaster moulds constitute environmental hazards at dumped sites and result in an unnecessary distraction. Such was the case at Kano Ceramics Manufacturing Plc in 1994, which was personally experienced by this researcher when he was the production manager of the industry. Researches have shown that the broken wares can be recycled into powder by crushing using the grinding machine. The ground powder can be processed into scotching powder that is used for washing metal objects and scrubbing of toilet tiles, bath-tubs and water closets while the crushed plaster mould are used as filler for the production of blackboard school chalk when mixed with active plaster of paris in acceptable ratio with either calcium carbonate or kaolin. This wastes materials if properly harness with adequate machinery, it would go along way at creating jobs for the youths in the manufacturing environment while also solving the problem of saturated dumping sites as highlighted by Kashim (2004).

Ceramics Manufacturing and the Environmental Issues

As previously mentioned continuous dump of ceramic waste after a period of time usually creates environmental problems especially in Nigeria where environmental laws are not properly enforced. The use of black oil and wood required for generating required energy for ceramics kiln firing leaves a lot to be desired with the international consciousness and hazard of global warming. Deforestation is at a high rate while attempting to generate enough firewood for wood kiln operation without adequate replacement is already leading to desertification. The felling of the trees may seem to improve quality of human life from what they are used for without the carrying capacity of supporting the eco-system. The excavation and mining of raw materials without adequate technology to complete the refill, depreciates the environment. The task of putting back the problems created from the mining site through refilling, compressing, and reclaiming by government agency will create more jobs while the task of forestation through massive tree planting could help boost the capacity building among the unemployed women within the environment; thereby increasing their productivity and alleviating poverty among them. The gas flaring in the Niger Delta can be processed into useable gas in the ceramics industries thereby creating more jobs for the restless youth in the Niger Delta areas of Nigeria.

RECOMMENDATION

Sustainability of the Nigerian environment encompasses the simple principle of taking from the earth only what it can provide indefinitely, thus leaving future generations no less than what the current generation has access to. Be that as it may, there is a need to comply with the United Nation Millennium Declaration that was set by 149 world leaders in September 2000, listing a series of millennium development goals (MDGs) for the target time of 2015. The objectives are to:

1. Strengthen intellectual mechanisms for implementation in the 5 areas of health, education, agriculture and food security, infrastructure, and statistical system.
2. Improve aid predictability
3. Enhance co-ordination at the country level.

The MDGs African Steering Group was launched at the African Union summit on July 1st, 2008, a land mark initiative of Secretary General, Banki-Moon of the United Nation. The groups comprising of leaders of United Nation, African Union, African Development Bank Group, the Islamic Development Bank group, the Organization of Economic Co-operation and Development, and the World Bank Group are all passive that Africa, as the poorest continent, has the likelihood of missing the globally agreed target chance of 2015. This is because they felt Africa might still fail to achieve the MDGS as adopted in year 2000. The meeting was to put forth a galvanized enhanced effort to reach this MDGS.

Based on the above factors the National Planning Commission (2004) developed National Economic Empowerment and Development Strategy (NEED) which was specifically meant to address the International Development Targets (IDTs), that is, improving economic well being, social and human development and ensure environmental sustainability and regeneration. To achieve this there is a need for Nigeria to develop its failed infrastructures in order to enable full capacity development at sustaining the environment if Nigeria must take its proper place among the committee of nations.

Housing is a fundamental need for dignified living as it represents a major area of deprivation among the Nigerian poor population. According to Olotuah (2009) the Federal Government of Nigeria, along side 131 other countries in 1976 endorsed 64 United Nation recommendations on housing during its conference on human settlement at Vancouver Canada. The recommendations were geared towards improving the housing circumstance of the Nation's poor majority. The rate of urbanization in Nigeria is among the highest in the world because manufacturing is stagnant. The process of creating affordable housing for the average Nigerian is by cutting cost on building houses and can be achieved by encouraging the use of local building materials that boarder on clay. It is therefore pertinent to adopt the Thailand option by strengthening the skill base of rural woman and unemployed youths in the urban settings through vocational and entrepreneurial skill development on clay deposit sites that can be used either for burnt brick making, using locally devised fire wood kilns or production of stabilized bricks with cement. This will provide jobs, increase standard of living, supplement high cost of building resulting from increased cost of cement, increase potentiality for housing provision to the less privileged, and encourage overall sustainability of the environment.

Conclusion

Environmental sustainability with Nigerian local ceramic earth resources, long term, would have cultural, economic, and environmental health vitality with emphasis on linking the social, financial, and environmental well being. That is, a positive change where environmental and social systems are not under scored by building equitable, productive, and participatory structures to increase economic empowerment of communities and their surrounding. The greatest challenge today in Nigeria and Africa at large therefore is to start to think sharply at transforming challenges to opportunities in the area of environmental management so they can more efficiently meet up with the faster growth and strengthened institutions in the developed nations outside Africa.

REFERENCES

- Kashim, I. B. (2000). Housing Provision in the 21st Century. The Relevance of Ceramic Materials. In O. B. Akinbamijo, A. S. Fawehinmi, D. R. Ogunsemi & A. Olotuah (Eds.), *Environmental Forum* (pp. 157-160). Federal University of Technology Akure, Nigeria: Urban and Regional Planning Department.
- Kashim, I. B. (2002). Ceramics as a Factor of Aesthetic to Environmental Enthusiast in Nigeria. In J. T. Agberia (Ed.) *Design History in Nigeria* (pp. 481-486), University of Port-Harcourt, Nigeria: Department of Creative Arts.
- Kashim, I. B. (2004). Toward Wealth Creation in Nigeria. The Possibility of Recycled Waste. *Craft Potters Association of Nigeria (CPAN) Journal of Ceramics*, 1(1), 63-65.
- Kennedy, J. F. (1963). *President's Address before the Irish Parliament, June 28, 1963*. Boston MA: John F. Kennedy Presidential Library and Museum. Retrieved from <http://www.jfklibrary.org/Research/Ready-Reference/JFK-Speeches/Address-Before-the-Irish-Parliament-June-28-1963.aspx>
- National Planning Commission. (2004). *NEEDS NIGERIA: National Economic Empowerment and Development Strategy*. Abuja: International Printing Techniques.
- Olotuah, O. A. (2009, March). *Demystifying the Nigerian Urban Housing Question*. An Inaugural Lecture Series 53 Delivered at Federal University of Technology Akure, Nigeria.
- Raw Material Research and Development Council. (2003). *Multi-Disciplinary Committee Report of the Techno – Economic Survey on Non – Metallic Minerals Sector* (4th update). Lagos, Nigeria
- Raw Material Research and Development Council. (2008). *Research and Development Update of Raw Materials in Nigeria*. Retrieved from www.rmrdc.gov.ng/.../raw-material...rawmaterials-update/60-raw-materials-research-and-development-council.html
- Redclip, M. (2005). Sustainable Development (1987-2005): An Oxymoron comes of Age. *Sustainable Development*, 13(4), 212-227.
- World Bank. (1994). Valuing the Environment. *Proceedings of First Annual International Conference on Environmentally Sustainable Development*. Retrieved from www-wds.worldbank.org/servlet/WDSContentServer/.../multi0page.pdf
- United Nation General Assembly. (1987). *Our Common Future* (Report of the World Commission on Environment and Development). Retrieved from <http://www.energy.kth.se/courses/4A1613/2008-2009/1987-brundtland%20pp%201-17.pdf>.

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