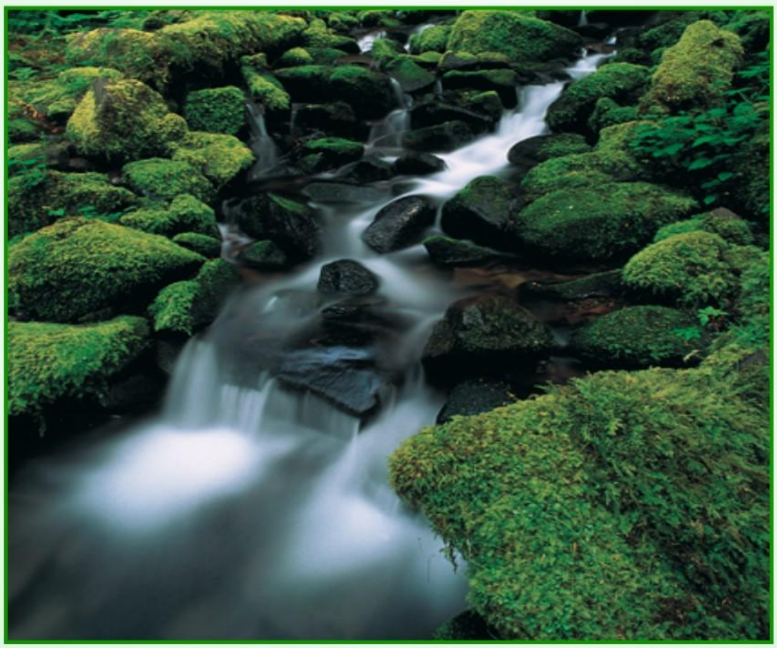


SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL PROTECTION

(Strategies and Procedures For Developing Nations)



Bells University of Technology, Ota.

Institute for Environment Research and Development

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SUSTAINABLE DEVELOPMENT
&
ENVIRONMENTAL PROTECTION
(Strategies and Procedures for Developing Nations)

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PREFACE

The conference on Sustainable Development and Environmental Protection (Strategies and Procedures for Developing Nations) was organized to bring together researchers, specialists and stakeholders from around the globe to share information and experience. The conference was designed to develop strategies around some of the core issues concerning how to develop strategies for a sustainable development and environmental protection in developing nations.

The conference themes were focussed at issues around:

a) Built Environment
b) The Natural Environment
c) Environmental Accounting
d) Environmental Governance and Corporate Social Responsibility
e) Environmental Health
f) Agricultural Environment
g) Socio-economic Environment
h) Industrial Environment

All the papers contained in this published Book of Conference Proceedings were selected from the thoroughly peer-reviewed large number of submissions received from nations across the continents. The Conference Planning Committee is optimistic that the information provided here within will provide readers and scholars current policy statements that would reflect the stand of the United African Nations' position on the issue of Africa environment.

Adedeji Daramola (Ph.D)
Chairman, Conference Scientific Committee

FOREWARD

The conference papers enumerate the global challenges of sustainable development, as well as the key environmental issues. The international responses to the challenges of sustainable development are discussed. Particular emphasis is put on the Report of the World Commission on Environment and Development - the Brudtland Commission (1987) which emphasized the social and economic dimensions of sustainability, revealing the links between, for example, poverty and environmental degradation.

Agenda 21, one of the outputs of the 1992 Rio Earth Summit, is a guiding document for sustainable development, it focuses attention on the core concept of sustainable development, it provides policy makers with a point of reference for linking environmental, social and economic issues. It stresses and suggests that all countries should prepare a "national strategy" for sustainable development and supporting policies instruments for giving these effects. . This call was repeated at the 1997 UN General Assembly Special Session and the World Summit on Sustainable Development (WSSD, 2002).

Despite this concern, however, commitment and knowledge of best practice instruments for National Sustainable Development Strategies remain relatively less developed, especially, in the developing countries. The main focus of the conference is to review the state of affairs with respect to sustainable development strategies and examine the existing strategy processes adopted particularly by developing countries.

In many countries, there is a range of past and current strategic planning approaches at both national and local levels. Some of these include National Development Plans, , National Visions, Sub-National Strategies, and Plans, Sector and Cross Sectoral Plans and Strategies, such as National Environmental Action Plans , and Strategies Related to Conventions.

In the developing countries, many of these, especially, the last two categories, have been externally conceived , motivated and promoted by multilateral development banks, developing cooperation agencies, UN organizations, international non-governmental organizations, (NGOs) and other external organizations- often as planning mechanisms to implement international agreements or as conditions for securing financial assistance. Few of these organizations have adopted or built on the systems , mechanisms and practices that were operating in the country for some time., such as national development plans, local plans and other community participation mechanisms. Furthermore, these approaches have been in developing countries as time-bound projects, rather than ongoing policy mechanisms , mainly by donors who have provided financial support and technical assistance, partly as a framework for planning aid support. Also, there has been limited emphasis placed by their sponsors on generating national ownership and establishing participatory processes for their elaboration.

Prof. OSUNTOGUN, Adeniyi

ACKNOWLEDGEMENT

The Conference Planning Committee is immensely grateful to the Institute of Environmental Research and Development (IERD) who brought about the idea of the conference and on whose platform the conference was hosted in collaboration with the Bells University of Technology. Thank you for providing the funds and logistics for the planning and execution of the conference and the ultimate production of this Book of Conference Proceedings.

We also wish to put on record the mentorship role played by the Vice Chancellor of Bells University, Ota, Prof. Isaac Adeyemi and his management team. Special thanks to all staff of IERD and supporting staff from Covenant University and Bells University, Ota, for the painstaking efforts in typesetting of the manuscripts and production of the soft and hard copies of the Book of Conference Proceedings.

To all others who contributed in one way or the other to ensure the success of the conference and the production of the Book of Conference Proceedings, your efforts and labour of love are most appreciated.

God bless you all and to HIM alone be all the glory.

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A CASE FOR CONSERVATION AGRICULTURE: PANACEA FOR SUSTAINABLE AGRICULTURAL PRODUCTIVITY, SOIL FERTILITY AND ECONOMIC GROWTH IMPROVEMENTS UNDER INNOVATIVE COWPEA CLIPPING MANAGEMENT IN DEGRADED SAVANNAH REGIONS

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ABSTRACT

Most African soils are typically impoverished and seriously deficient in nutrients due to Most African soils are typically impoverished and seriously deficient in nutrients due to severe depletion resulting from intensive weathering and high rainfall, high temperature, high decomposition rates, soil erosion, leaching, deterioration of the soil structure generally characterized by low soil organic matter content (SOM), low cat ion exchange capacity (CEC) and low moisture retention capacity of soils; resulting in low soil fertility and decreasing yields in agricultural and agro-forestry systems. Continuous cropping coupled with continuous nitrogen (N) fertilization is attended by human and soil health drawbacks. Since cowpeas are fast growing, cover the soil surface and produce large quantities of (organic) biomass; which if cut before senescence can regenerate and produce good growth. It is discovered that the proper management of this organic biomass in a green manuring system could provide some solution to the problems of low productivity; human and soil health of crops - grown under a high external (chemical) input production system - through the application of biological principles to enhance stability, resource-use efficiency and productivity. To the resource poor farmers, a green manure crop also should be additionally a cover crop of economic value. The clipped organic fodder could be added on and/or incorporated into the soil for (N and SOM) fertility improvement; and or traded off in a highly remunerating business. It is within this context that the study was carried out with the objective of determining the influence of intra-row spacing, innovative clipping height and time management and added clipped organic fodder on soil fertility improvements, economic growth and productivity of dual purpose cowpea (*Vigna unguiculata* (L.) Walp); spanning 2002-2005 cropping seasons. Result proved that the adoption of this innovative clipping management technology produced high fresh organic biomass (fodder) and grain yields of cowpea when crops were planted at the lowest intra-row spacing (15cm). Though highest grain yield was recorded with the unclipped (control) plants compared to plots clipped at 12.5cm and 25.0cm heights; and highest pod and grain yields were recorded when crops were clipped at 64 DAP than at 74 and 84 DAP respectively. However, this difference was more than compensated by the high quantity and quality of clipped fresh organic fodder that was added to the soil (14 – 15t ha^{1}) on-farm/in-situ; which availed the resource poor farmer a window for enhanced economic growth (#41, 000 - #46, 000); and further reflected in the total amount of N- gained (70%) by the soil (186-187$kgha^{-1}$) in the four years period (2002-2005) from clipped plots over the control (unclipped) plots. And when converted to monetary (financial) terms, a total of N18, 000 – N24, 000 was gained from added soil-N; and this potentially saved the resource poor farmer about 70%, in terms of the financial cost requirement, which would have otherwise being used to procure N-fertilizer inputs. Similarly, there was a 71% increase in the soil-OM content. It is concluded that such pro-poor income growths (from such innovative, technologically managed production systems) should be encouraged and supported; as this holds the potential of reducing global food insecurity and poverty in the African continent. Moreover, as it is predicated on the basic principles that: the biological aspects of soil fertility - which improves soil health - are a key feature of sustainable productivity. Indeed, overcoming soil OM decline is an important component in the development of more conservative and sustainable agricultural productive systems; especially in the degraded savannah soils of Africa. To be able to achieve increased and sustained (less chemicals and thus healthy) food production in these regions, there is a need to adopt this alternative integrated and practical soil fertility management method which incorporates and conserves organic nutrient sources that can also serve as a buffer for minimizing the negative effects of fertilizers. Evidences from conservative, organic agriculture (CA, OA) studies as this, is sustainable and productive.

Key words: Sustainable, conservation, organic, agriculture, productivity, clipped, biomass, fodder, regenerate, pro-poor, innovative.

INTRODUCTION

Most African soils come from rocks low in nutrient contents and being of ancient origin and having been subjected to leaching for a long time, coupled with the fact that they come from rocks low in nutrient contents, are therefore typically impoverished and seriously deficient in phosphate and other nutrients. But a proportionately large amount of available nutrients are retained in the vegetative cover and the soil–OM accumulates on the surface and subsequently mixes with the upper part of the soil. As such, if the vegetative cover is removed for cultivation (as in traditional farming systems and densely populated areas, where the pressures of urbanization on the land can lead to shortening of the fallow period; so that soil fertility can no longer be restored) and the soil put under intensive use without ensuring that the soil – OM is maintained at an appropriate level, with the attendant result that the fertility of the soil declines rapidly. Other factors consequential to the low fertility status of these soils includes amongst others the fact that nutrients are constantly exported in the form of harvested crops (soil mining); high rainfall intensity – resulting in compaction and the hardening of soils, erosion, leaching – leading to low soil – OM content, low CEC, and low water retention capacity. Compounding this problem is the permanent agriculture system practiced in the tropics which generally lead to in severe nutrient depletion in sub-Saharan Africa (Zake, 1993). As a result of the combination of all these factors, crop yields do not increase as expected in spite of the progress made in agricultural research on crop yield improvement. On most soils, fertilizer use efficiency decreases due to the deterioration of the soils as thousands of hectares of arable land are destroyed irrevocably every year (Kurt, 1982). Consequently, it is reported that more than 10kg N, 4kg P_2O_5 and 10kgK_2O per hectare per year are lost from the soil (Zake, 1993). Indeed, Africa is said to lose about $4 billion worth of soil nutrients every year and as if to "add salt to injury", in Africa efforts are being made to raise the current level of use of fertilizer from the average of 8kg ha^{-1} to at least 50kg ha^{-1} by 2015 (Ani, 2006).

It is estimated that 1.5 billion people are directly affected by degraded land and soil erosion. Over half of the worlds grasslands are degraded (Action Aid, 2009). Consequently, one major problem of most African soils is the rehabilitation of the degraded soils. While farmers resort to the use of chemical (inorganic) fertilizers to supplement or provide more nutrients to the crop (Cooke, 1982; Kurt, 1982); they fail to realize that the mere application of fertilizers to the soil does not necessarily trigger crop productivity (Zake, 1993). Rather, this continuous use of chemical fertilizers for crop production has given rise to situations where for instance, Labe (2002) reported that a millet crop now requires higher fertility rates to produce at optimum (level) capacity soils. Moreover, the use of chemical fertilizers beyond their immediate effects on crop yields has its draw backs. Tian *et al*., (1994) reported that cropping, coupled with continuous N-fertilizer application; reduces soil pH, soil organic matter, and extractable cat ions and redistribution in the relative amounts of the various cat ions in the soil solution. Enwezor *et al*., (1989) highlighted the fact that often times their residual effects are ignored, but when farming is continued on the same plot of land over years the residual effect of fertilizer treatments may considerably affect the soil's chemical properties and consequently, the yield of crop grown in later years. In recent times, serious attention and criticism has been raised on grounds of the serious damage caused to the environment by fertilizers and other chemical herbicides, pesticides and fungicides residues. But of more serious health concern though, is the diminished food quality due mainly to these chemical deposits on crop fruits and seeds; albeit raising serious questions as to the "purity" of our consumed basic foods; with some chemicals having entered the food chains to their detriment (Cooke, 1982). Nevertheless, these responses are reported to be ameliorated through practices known to provide the soil with organic matter from decaying plant residue, such as clipped cowpea fodder (Lu and Hue, 1990; Woomer and Mulchena, 1993; Odion and Singh, 2005a).

CONCLUSION

In essence, the findings of this investigation have shown that, through this clipping management practice, it is possible to improve on the productivity of the dual purpose cowpea. Moreover, the clipping management facilitates the production of large amounts of green plant organic biomass (fresh fodder) on-farm which can be put to various uses. Essentially, it further proves that Sustainable agriculture can greatly increase productivity among resource poor small holder farming communities in developing countries. This is particularly true if the existing farming system uses few fertilizers and other chemicals, which is largely the case for Nigeria and Africa as a whole. In effect this farming system which conserves - Conservation Agriculture (CA) – and/or even improves on resources has numerous advantages: It has tremendous potential for achieving sustainable yield increases by improving the growth conditions for crops and the efficiency of input. Indeed, higher yields led to greater access to food; increased food security for all members of the household and higher incomes; giving farm

families opportunities to improve their livelihoods: It reverses soil degradation processes and builds up soil fertility amongst others: Smallholder farmers are able to save money through less fertilizer and pesticide use; and accrue extra income from selling surpluses. Moreover, CA has the potential to bring higher prices in emerging markets because of the quality and safety of its production. Mounting evidence from studies as this show that conservation/sustainable agriculture is productive; and this study could be said to meet the three main goals of sustainable agriculture which integrates environmental stewardship, farm profitability and prosperous farming communities: Referring to the ability of farms to produce food indefinitely, without damaging soils and ecosystems, or human and social capital. Consequently, such pro-poor income growths originating from sustainable agricultural development as this, need to be encouraged and supported; as evident by the facts that it is productive and has the potential of reducing hunger, poverty and food insecurity in the region, Africa and the world in general (Sambo, 2009; ActionAid, 2009; Ching, 2009).

ENVIRONMENTAL PROTECTION AND SUSTAINABILITY REPORTING: EXTENSIBLE BUSINESS REPORTING LANGUAGE (XBRL) INTERACTIVE DATA TO THE RESCUE

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ABSTRACT

A company's environmental performance is important to the financial markets because improved environmental performance generally leads to higher, more sustainable, financial values. Challenges that arise in environmental financial accounting border on proper accountability of environmental costs and liabilities, meaningful disclosure of enterprise environmental performance, and development/usage of appropriate management accounting procedures (e.g. costing out pollution controls; comparing alternative materials that can be used in manufacturing; and investigating recycling alternatives). The need for standardized environmental performance indicators (EPIs) which link financial and environmental performance in order to support the quality of decision making of stakeholders cannot be overemphasized. In spite of the existence or underway development of a number of guidelines for measuring and disclosing environmental performance, many environmental indicators are of a limited benefit due to the lack of standardization of environmental information. Most information today moves in a digital format and people often go to the internet for information. Sustainability information, however, has largely remained in print, but report preparers and users have much to gain by moving environmental and social performance information into the wider digital flow of information. This paper therefore, while showcasing the importance of and need for environmental accounting and reporting, provides a recipe underscored by information standardization through the engagement of the twenty-first century corporate reporting language known as eXtensible Business Reporting Language (XBRL). XBRL enables an electronic "tag" on numbers or other qualitative information in the report so that computers can recognize the information, select it, analyze it, store it, exchange it with other computers and present it automatically in different ways. It concludes that the assurance about a company's financial projections and nonfinancial information (customer satisfaction, employee retention, or environmental reporting) and the integrity of the information itself through XBRL would enhance the effectiveness and efficiency of resource allocation, increase income and welfare, as well as achieve the objective of an environmentally sound management which encompasses increasing eco-efficiency, reducing environmental impact, and increasing company value added. It thus recommends that Nigeria and the developing countries should embrace the XBRL technology as they cannot afford to be left behind by the fast spreading current worldwide future reporting standard.

INTRODUCTION

In the latest years, attention to the environmental behaviour of the company is paid by many interested parties such as state institutions, the public and business partners. This is because the adverse impacts of the company activities, products and services on the environment may significantly endanger its

existence, prosperity, and may even result in its liquidation. Attention paid to technical, safety and environmental requirements by management is "rewarding"for the company while a sound approach to the environment may represent a significant competitive advantage for the business. The protection of the environment represents a highly relevant topic because negative environmental impacts are connected with the activity of each entity i.e. company activities, products and services cause changes of the environment, natural resources are consumed, and waste flows are released into the environment. Also, greater accent is put on sustainable use of resources, waste management, and enforcement of the "polluter-must-pay"principle, within the framework of international activities and national environmental policy. **(**Hyrslova and Hajek, 2006).

It is essential that an information system must always be in accordance with information needs of its users. This means that collection, recording, analysis, as well as reporting of information must, in the best possible way, fill the information needs of the most important interested parties. The information system must be capable of providing information to relevant users in the form enabling them to make decision. Thus, the attributes of such an information system must include the enablement to: have quick access to necessary information (without time delay); have possibility to examine company data in integrated form, as well as in detailed form; have possibility to analyze the established data; easily detect trends of planned or managed processes; and have possibility to continuously communicate and discuss the established facts.

Where the aims of an organization include a sound approach to the environment and improvements of economic performance, it is imperative that the management and other interested parties must have at their disposal information concerning the environmental aspects and impacts of the company activities, products and services on the environment, as well as their economic consequences. This paper showcases environmental accounting as a system that provides the aforementioned information, protects the environment and enhances sustainability reporting. lt recognizes the challenges that arise in environmental financial reporting and explores the solutions provided by eXtensible Business Reporting Language (XBRL), a twenty-first century language that is revolutionizing financial reporting worldwide.

CONCLUSION AND RECOMMENDATIONS

The connection between environmental effects and financial results is of concern to the enterprise: what impact on the environment, what control of the impact by the enterprise, and what financial consequences to the enterprise. Making this connection is the challenge to enterprise and the accounting profession, and to the broad audience whose interest is environmental protection. Sustainable development and environmental reporting increases the recognition of the 'triple bottom line' which incorporates economic performance, environmental performance, and social/ethical performance.

Sustainability and climate change are key issues confronting Nigeria and the global environment. If the various environmental problems are to be tackled, then there is need to access meaningful data through a global and digital medium such as XBRL. The implication of this is that organizations will be able to adopt a uniform approach that can then be aggregated in real time overcoming any information lag issues which will enable better strategic responses to the long term impacts of business upon the environment, leading to more sustainable approaches to business enterprise. In other words, XBRL will make possible a reporting future whereby: Companies release a standard set of environmental and financial information prepared according to generally-accepted reporting standards that meets many of the basic information needs of investors; Companies apply a common digital protocol for labeling and communicating this standard information; Researchers can directly access and import a company's sustainability data into their systems for analysis; and Companies can be confident that their publicly disclosed information quickly and easily reaches investors.

This paper has endevoured to bring to limelight, the XBRL which is a global standard that is now gaining acceptance and Nigeria as well as the developing world must be aware that XBRL will soon become the international digital language of business. Its adoption is not a matter of if, but when. It has posited that the XBRL offers a way-out opportunity to the challenges of environmental and sustainability reporting in the twenty-first century as a result of its Standardized Business Reporting (SBR) features.

Since it is imperative that new and innovative approaches to sustainable business practices based on knowledge and technology are developed so that enterprises, small, medium and large and indeed governments can make decisions that will define how their operations, products, services and activities impact upon the environment and society at large, the following recommendations are hereby suggested:

(i) Private and public sector stakeholders in Nigeria and the developing world should embrace the use of the XBRL as it is an inevitable path globally towards the adoption of Standard Business Reporting (SBR) in order to improve, not only financial reporting, but also social and environmental sustainability reporting.

(ii) Accounting regulatory bodies like Institute of Chartered Accountants of Nigeria (ICAN) and the Nigerian Accounting Standards Board (NASB) should introduce accounting and reporting standards that will take care of environmental/sustainability information dissemination through the internet and the XBRL.

(iii) Environmental and sustainability reporting stakeholders should come together to fashion industry suitable environmental-specific reporting standards which will engage the adoption of XBRL and its improved taxonomies in development and implementation.

(iv) Selecting the "right" tag for business data requires professional knowledge and judgment. As companies prepare to launch into their initial XBRL-based communications, proper planning and internal communication will be essential.

(v) Proactive Nigerian organizations looking to gain competitive advantage should set rolling the process of leveraging their efforts in pilot XBRL projects inside their organizations. Particularly, those who are: academics, researchers, auditors/accountants, regulators (SEC, NASB, etc), preparers of financial information, accounting professionals (KPMG), analysts, software developers (Microsoft, PeopleSoft, SAP, Hyperion), professional services providers, intermediaries (Reuters), investors / creditors, and non-governmental organizations, should all get involved.

(vi) There is need for awareness and training conferences/workshops on XBRL to be hosted by professional bodies, environmental institutes, government organizations, academic institutions, and business groups/organizations. These would be designed to help company leaders and academics understand this new communication standard and transit interested parties (e.g. companies/students) to the new financial reporting mandates. Conferences/workshops are a great way to ensure success on that journey.

(vii) The government, regulatory agencies, environmental experts and public policy decision makers in developing nations need to commence project initiatives that will enable them to readily check that disclosures and filings (financial, nonfinancial, and sustainability information) are accurate and not misleading. The establishment of electronic government mechanisms for easy access to corporate social responsibility information is made possible through the more appropriate xbrl format. Advisory committees that will pave the way for requiring companies to turn their environmental financial statements into more easily searchable, comparable, and interactive documents must be constituted. For example, all publicly traded companies could be required to file audited XBRL financial statements in three to five years. In the near term, the largest companies could be required to use the extensible business reporting language to tag their environmental data and share that information with the regulatory bodies without an external auditor's review.

(viii) Universities and other educational institutions should start training current accounting and information systems students to prepare them for jobs that will involve XBRL implementation and use. The XBRL concept, projects, and education should form a strong part of the curricula in schools at tertiary and secondary levels.

(ix) Organizations will need to form XBRL implementation teams to consider modality issues such as: How should XBRL return on investment be determined? What are the relevant costs? How can the long term benefits be quantified? What is the proper conversion process? Should the current financial reporting system run parallel to the XBRL system? Should the implementation work or the reporting system be outsourced to consultancies? What role should be played in the conversion to a mandated XBRL-based financial reporting environment?

(x) Every organization in every industry, particularly the big size ones should immediately set in motion activities that will culminate into a full embrace of the XBRL digital reporting technology in order to take advantage of the revolutionary development affecting environmental financial services, e-Government, business intelligence/ knowledge management, supply chain, information providers /content, and business performance. The way to get there is by following the path of: Needs Assessment, Design Solution/Business Plan, Training and Education, as well as Implementation.

(xi) Finally, there is need for government to promote the XBRL as a national means of aggregating and communicating current/future Generally Accepted Accounting and Environmental Standards, through a strong will power reflected in development activities/policies.

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LOW COST MATERIALS FOR BUILDING AND CONSTRUCTION: A CASE STUDY OF RICE HUSK

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ABSTRACT

Nigeria has for many years been over dependent on conventional and imported building materials which are rather costly and beyond the affordability of the common man. The building industry in Nigeria is encapsulated with shortage of affordable building and construction materials. People have difficulties building houses of their own because the costs of building materials are astronomically high. A look inward reveal that Nigeria has a good number of agro-allied wastes, industrial wastes and mineral deposits such as rice husk, saw dust, coconut fiber, palm kernel fibre, marble dust,caicium cabonate to mention but a few. Rice husk is produced in many parts of Nigeria such as Abakaliki, Afikpo, Ogoja, Ikepe, Lafiaji, Badeji, Pategi, Sokoto, Birnin Kebbi, Abeoukuta, Benin and Delta regions. Rice husk dumps are mountainously available in alarming proportion in Abakaliki and other communities. The rice husk dumps contribute immensely to environmental pollution, degradation and hazards. The evacuation of rice dumps. From these communities requires urgent attention. With an optimized ratio the researcher used Rice husk, marble dust, pulp, cement and water to produce ebonite roofing tiles. The researcher invented a chemical locally made that can be used to treat rice husk and make it workable in the production of roofing tiles. It can not work except it is treated. Also burning the rice husk before use would destroy its water repellent qualities. The equipment used are vibrator, Italian vortex hydra ferrar, pulverizing machine, oven, shovel and trowels, twenty four tests were carried out on the tiles including fire endurance (30min) U-value (0.22w/m2lx), water absorption capacity (25%). Tensile strength (45/cm^2) and modulus of rupture (0.99N/mm^2). The test results were satisfactory in accordance with Bs 1191, 6463 part 4 Bs 4550/ Bs 43359, Din 4202 and ASTMC 204. The tile is cost effective, strong, maintenance free; resistant to corrosion, water and heat, and it is not casenogenic.

INTRODUCTION

The study of low cost materials for building and construction is an area of human endeavour which collaborates directly or indirectly to the socio cultural and socio economic setting of the people or community. The level of technological development determines the level of social, economic and environmental development. Nigeria for a long time, has depended on conventional building materials which are rather astronomically costly. The problem of over dependence on conventional building materials can be solved by diverting our attention toward the local sourcing of alternative materials for building and construction. It was for this reason that the Nigerian building and road research institute (NBRRI) was established in 1978 (ukot 1989). NBRRI laid emphasis on the development of suitable local building materials from mineral deposits and agro industrial wastes that are abundantly available at little or no cost. The waste materials that are available in our environment include rice husk, saw dust, coconut fibre, palm kernel fibre, marble dust, stone dust to mention but a few. Rice husk for instance is abundantly produced in many parts of Nigeria such as Abakaliki, Afikpo, Ogoja, Ikepe, Lafiagi, Badeji, Pategi, Sokoto, BirninKebi, Abeokuta, Benin and Delta region. Rice husk dumps are increasing in alarming proportion at Abakaliki. Disposing and evacuating the rice dumps is urgently necessary because of the impending environmental hazards, degradation and pollution it posses to the people and the environs. In attempt to dispose rice husk, most communities, set the rice husk takes dumps on fire. Unfortunately a small heap of rice husk takes months to get burnt to ashes. Opara (1998) noted that rice husk burns to ashes at the temperature of 800^{o}F. Even when burnt to ashes, it is still an eyesore in the communities especially during the rainy season. Rice husk dump on fire constitute serious environmental hazards especially during the harmattan season when the dust devil and other manner of winds blow. It can set nearby buildings on fire. Some people are known to have died by unknowingly running into or stepping into rice husk dumps on fire beneath the surface.

Rice husk can be used in the production of roofing tiles. Okorie (1994) stated that the harvested rice kernel known as paddy is enclosed by the hull or husks otherwise called rice husk. To obtain the rice husk, the rice paddy is parboiled, dried and milled to separate the rice from the husk. He also revealed that the rice husk contains cuticule,a biological membrane that does not allow for easy.

SUMMARY OF RESULTS

The results of the test sample were satisfactory in accordance with BS 1191, 6463: Part 4, Bs 4550/BS 43359, DIN 4102 and ASTMC204

IMPLICATION FOR SUSTAINABLE TECHNOLOGICAL DEVELOPMENT AND COMMERCIALISATION.

The federal and State Government should realize that there is urgent need of reduction of prices of contemporary building materials through the manufacture of local building materials. With the break through in the sourcing of a local material that can be used in the production of roofing tiles such as rice husk, immediate action should be taken to establish large or small scale industries to utilize rice husk dumps in the production of roofing tiles.

The establishment of rice husk roofing tile industries will set in motion a giant stride in sustainable technological development in the country. . Rice husk is not casenogenic and has no infection whatsoever. Rice is an edible food. It will project the image of Nigeria technologically to the outside world.

Rice husk roofing tile industries, if established will create an open door for job opportunities for youth wishing to choose career in the production of roofing tiles and maintenance of machines used in the production of roofing tile. It will surely reduce the unemployment and poverty rate in Nigeria.

The production of rice husk roofing tile is the most effective means of disposing of the rice husk dumps in rice producing communities thereby solving the problem of environmental degradation, environmental pollution and environmental hazards caused by rice husk dumps in the rice producing communities in Nigeria. The commercialization of this rice husk roofing tile is a direct ticket toward the achievement of the melenium goal and the seven-point agenda of the president his Excellency, Shelmusa Yaradua[late]

Investors should utilize this golden uportunity to enlarge the scope of their business , to advance Nigeria technologically,.,to make shelter accessible to the common man and to eradicate poverty in Nigeria.

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URBAN RENEWAL AS A TOOL FOR SUSTAINABLE URBAN DEVELOPMENT IN NIGERIA: ISSUES AND CHALLENGES.

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ABSTRACT

Proliferation of hooliganism, criminality, housing problems, infrastructural decay, social vices, environmental degradation and traffic congestion have been considered outcomes of rapid population growth and tremendous pressure on civic infrastructure systems. Urban renewal is perceived to play an important role in the policy towards sustainable development of cities. The paper achieves this through a literature review of urban renewal programmes and draws out implications for effective urban renewal programme in Nigeria.

KEYWORDS: City, Nigeria, Urban Renewal, Sustainable Development, Urban Decay

1.0 INTRODUCTION

For centuries, cities have been the heart, the lifeblood of various civilizations, the epicenter of economic, political and artistic activities (Spates and Macionis, 1987). Cities, as seen today exert an increasing attraction on people worldwide; in fact, the population tends to concentrate in big cities. Gomez and Salvador (2006) opined that in the 21st century the number of people living in cities will progressively increase. City is not an artificial construct; the city is a set of habits, customs and lifestyles. These elements are interrelated, and rather than being viewed individually, they are subsumed in the identity of place and the identification of the city (Sepe, 2006). According to the author, the contemporary city is characterized by complexity, simultaneity and instability, producing situations of transience and transformation.

In the developed countries in Europe and America, transformations have contributed to an increasing urban identity crisis which transformed cities into heterogeneous. The mutations in interpersonal relationships and intergeneration gaps, technological development, mass migrations and globalization have transformed to spaces in the urban landscape; new types of place have arisen and the utilization of existing spaces has been modified (Sepe, 2006; Gospodim, 2002; Gospodim, 2004, pp. 225).

Urban cities occupy only a small part of the territory; actually cities occupy 2% of the surface area of the territory (Gomez and Salvador, 2006; Terradas, 2001). However, each city has its own history, marked by the way it extended and grew; thus it is not surprising to find cities that expanded and occupied new land even in periods in which the population was decreasing.

Urban phenomenon is continuously increasing, extending the boundaries of the city or metropolitan areas. Thus, urban planning is experiencing a crisis; at least the concept of urban planning that appeared with the modern movement and its myriad of architects. The reality in the big cities in Nigeria such as Lagos, Ibadan, Port Harcourt and Benin presents a number of problems that are worth mentioning. These include urban decay, slum, overcrowding, lawlessness; invasion of periurban spaces causes the loss of land and natural resources. The basis of the urban crisis lies in the dimensions and expansion of the large cities where these problems become even more severe. For instance forty-two slum communities or "blighted areas" were identified in Lagos metropolis in 1981 by a World Bank Urban Renewal project. The number of slums in the city is estimated to have increased to about 100 due to the inadequacy of private public institutions to provide housing the increasing population (Adelekan, 2009).

Inadequacy of basic infrastructures in the urban centres, in many African cities, poor urban planning together with other urban governance challenges contributes to making African urban slum dwellers works at risk. Poor urban planning or lack of planning as urban development increases is evident in not preventing new development on areas at risk of flooding (Adelekan, 2009). According to McGranahan et. al (2007), economic activity and urban development often increase the environmental pressures that lead to flooding and slum. The foregoing provokes the scholars' investigation into the issues of urban regeneration as a tool for sustaining urban development. The objectives of the study are to: examine the level of urbanization in Nigeria, concept of sustainable development; identify and examine the phases of urban

decay in the system, examine issues of urban renewal /development for urban sustainability and strategies; and identity the challenges of urban renewal in Nigeria.

Conclusion

As stated (Ademiluyi and Solanke, 2008), Nigerian Urban centers are faced with numerous problems, so complex are these problems, that they (urban centres) can be described as an increasingly important stages on which all aspects of the human drama are performed; the highest learning and the grossest ignorance, unimaginable levels of wealth and the most abject poverty exists side by side.

Urban areas in Nigeria depend on natural resources for water, foods construction materials, energy and the disposal of wastes. Urbanization will not, however, deliver its benefits for sustainability automatically; they require careful preparation and nurturing. Thus revitalization of city centres calls for implementation in Nigeria. Restoring vitality to urban centres means designing centres of attracting. It means offering more and different reasons to come to the city. It also means offering a space that can be used by different groups of people with different needs, each that can find satisfaction.

The above discussion and measure are fundamental to ensure efficient urban renewal that can transform our cities in Nigeria.

9.0 Recommendation

The interaction between urbanization and natural resources underlines the need for renewal for sustainability. Perhaps for the Nigerian urban centres to be healthy, and sustainable, the extent of urban decay needs to be investigated and renewal approaches should be identified as done in this study.

Urban renewal or redevelopment can be a useful tool to facilitate the transformation of Nigerian cities. Effect of UNDP and World Banks - Assisted projects on urban renewal in Nigeria cities recently have delivered a commendable dividend in Nigeria.

However, in order to ensure sustainable urban development, it is important to take note of the following issues for implementation among others:

Proper education and enlightenment of people on issues of urban renewal.

(i) Involvement of private public partnerships – NGOs
(ii) Private firm or agency
(iii) Adoption and renewal of the ideas of new towns and satellite towns in Nigeria.
(iv) Development of rural areas and provision of infrastructure.
(i) Creation of job and enabling environment for youths.
(ii) Inauguration and empowerment of urban management taskforce.
(iii) Effective regulation for housing standard approval.
(iv) Provision of low – cost and low – income housing for the needy population.
(ix) Enforcement of code of conduct in the built environment.
(v) Adequate compensation of the owners of dispossessed properties marked for clearance.
(vi) Emphasizing sustainability in infrastructure design and planning in a way that will foster human activity and support economic growth without hindering the environment.
(vii) Utilizing the wealth of management techniques and expertise gained from previous urban developments to coordinate and manage the new development efficiently.
(viii) Using advanced technologies (both in materials and information technology) to optimize the overall provision and management of the new facilities such as GIS.

(xiv)Institutional framework: This include-

a. Institutional arrangements in formulating and implementing urban renewal policies.

b.Statutory and executive power of implementation agencies and its composition of the board and public accountability.

C.Land law and administration related to land ownership/tenure in the context of planning and redevelopment, the policy approach and powers to enable property acquisition or resumption.

d.Compensation and rehousing policies.

(xv)Financing models of urban renewal, financial arrangement of implementation agencies, and other financial instruments (e.g. tax relief or tax incentives).

(xvi)Relative emphasis on different types of urban renewal (i.e. redevelopment, rehabilitation, revitalization and preservation).

(xvii)The use of social impact assessment.

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SUSTAINABLE USE OF NATURAL RESOURCES AND DIVERSITY IN FARMING SYSTEM

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INTRODUCTION

In general terms, sustainable use of natural resources is simply the use of natural resources continuously for a long time, while diversity in farming on the other hand is the application of a range of cultural practices that are different from each other in the farming operation. Sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. Therefore, *stewardship of both natural and human resources* is of prime importance. Stewardship of human resources includes consideration of social responsibilities such as working and living conditions of laborers, the needs of rural communities, and consumer health and safety both in the present and the future. Stewardship of land and natural resources involves maintaining or enhancing this vital resource base for the long term.

Three kinds of reserves of natural resources can be identified (Reijnders 1999, Chapman 1983): continuous resources such as sunlight and wind, the use of which does not lead to a reduction in their size; renewable resources, such as wood and crops that can be harvested – but not faster than their rate of replenishment; and non-renewable resources such as fossil fuels and minerals. The last are created by very slow geological processes, so slow in human terms that their use diminishes the available stocks. Resources such as clean water, fertile soils and biodiversity, given the time required for their recovery, can also be considered to be non-renewable. The Club of Rome first drew attention to the depletion of resources at the beginning of the 1970s. At that time the emphasis was on the depletion of fossil and mineral resources. It was assumed that various important natural resources such as oil and various metal ores would be exhausted within a few decades. In fact this turned out not to be true.

Discoveries of new deposits, technological advances and falling energy prices have made possible the recovery of lower grade ores, and the estimated remaining lifetimes of some resources have been considerably extended.

But this is no reason for complacency. Sooner or later, at the current rate of consumption, the reserves of certain resources will be exhausted. This may be a long way off for a number of fossil fuels and mineral ores, but other resources such as biodiversity and fertile soils are being used up so quickly there is a danger that critical thresholds will be crossed. The drain on biotic resources is particularly alarming; biodiversity and fertile soils are being rapidly used up. Research by WWF indicates that the 'health' of the world ecosystem, based on measurements of the loss of forest area and freshwater and marine animal species, has declined by 30% in 25 years (WWF 1998). Half the natural forest

cover worldwide has already disappeared, 13% in the last 30 years. Europe only has 1% of its original forest cover left. And there is no sign of this attack on biodiversity diminishing.

The Earth's natural resources are vital to the survival and development of the human population. Some of these resources, such as minerals, species, and habitats, are finite — once they have been exhausted or destroyed, they are gone forever. Others, such as air, water, and wood, are renewable — although we

generally rely on the Earth's natural systems to regrow, renew, and purify them for us. Although many effects of over-exploitation are felt locally, the growing interdependence of nations and international trade in natural resources make their management a global issue. A careful and well planned integrated crop, livestock and fish farming will go a long way at ensuring sustainability of our natural resources and environmental protection.

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EVALUATION OF OPTIONS IN WOOD WASTE MANAGEMENT: BURNING AND CONSEQUENT ALKALI PRODUCTION

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ABSTRACT

The study assessed burning and consequent alkali production as options for management of wood waste. Management of municipal solid waste in Nigeria has become a hydra-headed problem; the menace of solid waste in the environment has never justified both the efforts of government and individuals; and hence the need for continual research on various options for sustainable management of solid wastes. Nine different common African wood species - *Irvingia gabonensis* (Orokoro*), Celtis Zenkeri* (Ita), *Albizia zygia* (Ayunre), *Terminalia superba* (Afara), *Cola gigantia* (Obi), *Cordia millennia* (Omo), *Funtumia elastica* (Ire), *Ceiba petandra* (Araba) and *Ficus exasperata* (Obobo), were assessed for combustion and alkali production as options for management of wood waste. The wood waste (sawdust) from these species was obtained from a wood factory located behind Bodija market in Ibadan. Ashing was conducted on saw dusts in porcelain crucibles at 500^{o}C for 4 hours in a muffle furnace for the determination of ash contents. Extraction of potash from the ashes was done using distilled water with a set of filtration system made up of 4-litre transparent plastic bottle with ash sediment itself serving as a sieve while the extract solution leaked out through pin-holes made at the bottom of the bottle. The purity of the crude potash and proportions of hydroxides and carbonates were determined by titrimetry; while recrystallization of the crude potash was carried out on three of the wood species which showed low purity to evaluate possible enhancement of their purity. The average reduction in volume of sawdust was 95% after combustion. The ash content obtained ranged from 1.25 to 8.80%; potash content, 2.77 to 26.88%; crude potash purity, 4.50 to 96.50%. Volumetric estimation may portray a better picture of ash and potash yield potentials of the plant materials, and hence expressed as 1.42 to 15.18 kg/m^3, for ash content; potash yield ranged between 4.74 to 53.76 kg/m^3 of ashes and 0.21 to 1.53 kg/m^3 of saw dust. The hydroxide content obtained ranged from 0.00 to 1.22%; carbonate content, 4.09 to 96.09%; non-alkali content, 3.50 to 95.50%. The purity was enhanced from 61.50% to 83.10% for Albizia zygia, 65.00% to 80.90% for Funtumia elastica, and 46.50% to 68.00% for Ceiba pentandra.

Keywords: wood waste, ash, potash, alkali.

INTRODUCTION

Approximately three million tons of wood ash is produced annually in the United States, out of which 70% is being lanfilled, around 20% is being used as soil supplement, and the remaining 10% is being used in miscellaneous applications (Tarun et al., 2003). The use of wood ash in the past had primarily been restricted to its utilization as liming agent and a source of nutrients for plant (Campbell, 1990).

The chemical composition of an ash depends on that of the substance burned: palm bunch wastes, cocoa pod, plantain leaves, maize cob, wood and sugar beet waste (Irvine, 1965); wood ash contains metal carbonates and oxides formed from metals originally compounded in the wood; seaweed ash contains sodium carbonate, potassium carbonate, and iodine that can be extracted(CEE, 2003).

Exploration of ash-derived alkalis for domestic use is an age-old craft (Onyegbado et al., 2002; Nwoko, 1982). Studies of chemical composition of wood ash in the past have primarily been restricted to the elemental composition (Baker et al., 1964) as the focus was largely on the agricultural use of wood ash. A common assumption in most of these analyses has been that the minerals present are oxides of different elements (Mahendra, et al., 1993). The assumption may be sufficient to identify the extent of alkalinity of wood ash (Shelton and Shapiro, 1976).

Analysis of extracts from ashes by Nwoko (1980) and others (Onyegbado et al. ,2002; Onyekwere, 1996; Kuye and Okorie, 1990) showed that the extract was chiefly potassium hydroxide with some

quantities of sodium hydroxide, while other metallic ions constituting about 2% were Ca^{2+}, Cr^{2+}, B^{3+}, Zn^{2+}, Fe^{3+}, Pb^{2+} and Ni^{2+}. Tarun et al. (2003) tested different sources of wood ash from USA and Canada; they had a specific gravity between 1.6 and 2.8, unit weight between 365 and 980Kg/m^3; the major elements in the wood ashes tested were carbon (5 to 30%), Calcium (7 to 33%), potassium (3 to 4%), and sodium (0.2 to 0.5%). Ashes have a composition which varies according to the kind of wood and the soil in which it grew (Kevin, 2003). The physical and chemical properties of wood ash vary significantly, depending upon various factors, which in addition to the kind of wood and soil include method and manner of combustion, efficiency of the boiler, and other supplementary fuel used with wood (Tarun et al., 2003).

Several authors have studied the potash yield of plant materials : carbonate content of 40-60% (Afrane, 1992) and 56.73+0.16% (Taiwo and Osinowo, 2001) were obtained for cocoa husks; 78% for ripe plantain peel and 94% for fresh plantain trunk (Ankrah, 1974); 82% in unripe plantain peel (Onyegbado et al. , 2002); 43.15+13% in palm bunch, 16.65+0.05% in groundnut shell, 12.40+0.08% in sorghum chaff (Taiwo and Osinowo, 2001) and alkali content of 6.3-86.7% in the peels of some varieties of Nigeria grown *Musa* species (Babayemi *et al,* 2010b). Potassium content of some wood species were analyzed by Misra et al (1993): pine (16.24%), aspen (11.25%), yellow polar (7.93%), red oak (6.08%), and white oak (10.25%).

Potash has been described as a white crystalline residue that remains after aqueous extract from ashes is evaporated (Kevin, 2003). It is an impure form of potassium carbonate mixed with other potassium salts (Wikipedia, 2007). These could be produced locally and industrially. There are various local extraction technologies, depending on the desired quality, quantity and intended use of the resulting potash (Babayemi *et al,* 2010a). Generally, containers made of aluminum are to be avoided since alkali attacks aluminum. Fig. 1 shows a typical ancient traditional extraction technology. It consists of two clay pots (of about 50 litres each) mounted on each other. The one on top is open at the base, with radius about half the open top. The open base is completely blocked with pieces of sticks, followed by a layer of wood charcoal. The remaining space on top is then packed with ashes which had already been moistened with water for some days to aid quick extraction. Water is then carefully poured on top, as to only saturate the ashes, and not to leach the desired component yet. After few hours, when the ash would have completely absorbed the water and every large pores and air spaces blocked, sufficient water is then carefully poured on top. The water slowly leaches the potash into the lower pot, the ash itself serving as a filter. Perhaps the charcoal removes some unwanted organics from the leaching potash. The potash produced this way is usually coloured brown, and may have contributed to the black colour of the local soap produced with it.

Fig. 2 shows a corresponding laboratory experimental set-up used by Kevin (2002). At the top is a transparent plastic bottle of about 2 litres capacity and at the base is a beaker. The bottle is filled with ashes to about one-third. Sufficient water is added, capped and then shaken thoroughly to dissolve the soluble components. The ash is allowed to settle, till a clear liquid is observed at the top. One or two pin-holes are made at the bottom, and then placed on the beaker, while the cap is removed. The solution on top is filtered by the ashes as it leaks into the beaker. The potash solution obtained this way is usually clear, that is, colorless, although it also depends on the source of the ash.

One of the major management problems in the mega-cities of Nigeria is that of solid waste disposal. Wood waste and ashes take a considerable percentage of solid wastes being generated in Nigeria every day. Wood factories, including saw mills, are established in their thousands in various states, with thousands of tons of wood shavings and saw dusts being generated each day (Aina, 2006). At present in Nigeria, apart from the insignificant use as poultry deep litters, the largest percentage of saw dusts and wood shavings end up in dump sites as waste, where they are burnt and the ashes carried away by flood every year. The ashes generated, including those from combustion of firewood in various homes and food canteens, are either land-filled or open-dumped. This report evaluates the efficiency of burning and consequent extraction of alkali from the resulting ash, as options for management of wood waste.

Results and Discussion

Table 1 shows the results of the moisture content, dry matter content, density of sample, and density of ashes; the values ranged from 12.50 to 18.16%, 81.84 to 87.50%, 0.06 to 0.23g/ml, and 0.05 to 0.40g/ml respectively.. The values of ash and potash contents obtained (Figure 3) ranged between 1.25 to 8.80% and 2.77 to 26.88% respectively. Crude potash purity (4.50 to 96.50%), hydroxide content (0.00 to 1.22%), carbonate content (4.09 to 96.09%), and non-alkali content (3.50-95.50%) are presented in Table 2. The results of ash and potash yield based on volumes (Table 3) were 1.42 to 15.18 kg/m^3, for ash content; potash yield, 4.74 to 53.76 kg/m^3 (of ashes), and 0.21 to 1.53 kg/m^3 (of saw dust). The average reduction in volume of sawdust was 95% after combustion. Table 4 shows the amount of KOH compared to K_2CO_3, and

the values ranged from 0.00 to 9.21% and 90.79 to 100% respectively. The purity was enhanced from 61.50% to 83.10% for Albizia zygia, 65.00% to 80.90% for Funtumia elastica, and 46.50% to 68.00% for Ceiba pentandra (Figure 4). Figure 5 (correlation coefficient, R^2 = 0.0324) and Figure 6 (correlation coefficient, R^2 = 0.0795) show the correlations between ash and alkali contents (% of sawdust samples) and between ash content and potash content, respectively.

Funtumia elastica gave the highest moisture content while *Funtuia elastica* had the lowest dry matter content. *Ceiba pentandra* had the lowest moisture content, highest dry matter content, lowest density and lowest ash yield. *Terminali superba* had relatively lower moisture content, relatively higher dry matter content, relatively high density and highest ash yield. *Funtumia elastica* gave the lowest ash yield, while *Terminalia superba* gave the highest. This observation was completely reversed in the case of potash yield: *Terminalia superba* gave the least potash yield. A higher yield was obtained for *Funtumia elastica* and *Ficus exasperata* gave the highest yield. It may then be inferred that where ash yield is of interest, *Ficus exasperata* offers the best option; and where potash yield is of interest, *Ficus exasperata* offers the best option.

As shown in Table 3, the results of the determination of ash content in terms of volume ranged from 1.62 to 15.18kg/m^3 (of sawdust). Taking the upper value (15.18kg/m^3) as the ash content, it implied 1m^3 sawdust generated 15.18kg ashes; the density of the ash under consideration was 0.32g/ml; then the volume of ashes produced would be 0.05m^3, implying 95% reduction in volume. And assuming the wood factories generated 82 368m^3 of sawdust per day (Babayemi and Dauda, 2009), it gave 1 250 346.2kg ash generation rate per day, and 456 376 363kg or 1 503 216m^3 per year. Potash content of the ashes ranged between 4.74 and 53.76kg of potash per cubic metre of ashes. Taking 53.76kg/m^3 as the potash content of the ashes, 1 503 216m^3 of ashes will yield approximately 80 812 892kg of potash annually. What a great resource!

Alkali content observed for *Ficus exasperata* was the highest; and *Irvingia gabonensis*, being the least. The high alkali content suggests potential use as laboratory reagent, since these results are comparable to the recommended purity of 99.999% (for primary standards). In the results of hydroxide compared to carbonate contents, the observation showed that 80% of the wood species gave hydroxide content of less than 1%. It may then be inferred that potash from ashes is predominantly carbonate of potassium or sodium. The formation of oxides K_2O and Na_2O suggested by Onyegbado et al (2002) could only be true for the burning of pure metals in air; this may not be applicable to the burning of these metals in organic matrices: the potassium or sodium in plant materials is bound in organic matrix of which carbon is a major constituent. During combustion, there is a high release of carbon (IV) oxide, leading to the formation of carbonate rather than oxide of the metals as suggested by these authors.

Irvingia gabonensis contained the highest non-alkali content and *Ficus exasperata* contained the least. A very high percentage of 95.50 of non-alkali salt in *Irvingia gabonensis* also call for further studies, as this could be a breakthrough in the discovery of another source of raw materials for chemical industries.

The results obtained after the enhancement of purity of the crude potash by recrystallization show the possibility of improving upon purity of potash alkali and making it fit for various uses.

If R^2 approaches 1.0000, it means there is a very high relationship between the compared parameters; otherwise, there is little or no relationship. The two Figures 5 and 6 showed no correlations.

Conclusion

Ficus exasperata, *Ceiba pentandra* and *Funtumia elastica* gave higher potash yield and very high purities were obtained for *Ficus exasperata*. These wood species could be recommended as choice materials for potash production. Wood waste volume could be reduced by 95% after combustion, and the resulting ashes could serve as a source of the much needed potash in the production of soap and other potash-based materials

Table 1. Moisture content (MC) (%w/w), dry matter content (DM) (%w/w), sawdust (wood) density (SD) (g/ml) and ash density (AD) (g/ml)

	SP_1	SP_2	SP_3	SP_4	SP_5	SP_6	SP_7	SP_8	SP_9	SP_{10}
MC	13.54	16.42	12.99	12.99	12.50	13.28	18.16	12.84	12.77	13.08
DM	86.46	83.58	87.01	87.01	87.50	86.72	81.84	87.16	87.23	86.92
DS	0.16	0.12	0.15	0.23	0.06	0.15	0.13	0.23	0.17	0.14
DA	0.05	0.20	0.20	0.12	0.09	0.24	0.12	0.32	0.40	0.13

Table 2 Crude potash purity, amount of KOH, K_2CO_3 and non-alkali (NA) contents (%) (of crude potash).

Wood species	Purity	KOH	K_2CO_3	NA
Irvingia gabonensis	4.50	0.41	4.09	95.50
Celtis zenkerii	45.60	0.00	45.60	54.40
Albizia zygia	61.50	0.00	61.50	38.50
Annogissus celocarpus	93.00	1.22	91.78	7.00
Terminalia superba	44.00	0.42	43.58	56.00
Cola gigantia	4.50	0.00	4.50	95.50
Cordia millennii	64.50	0.39	64.11	35.50
Funtumia elastica	65.00	0.39	64.61	35.00
Ceiba pentandra	46.50	0.00	46.50	53.50
Ficus exasperata	96.50	0.41	96.09	3.50

Table 3 Ash (AC) and potash (PC) contents of some different wood (sawdust) samples (WS)

Content	SP_1	SP_2	SP_3	SP_4	SP_5	SP_6	SP_7	SP_8	SP_9
AC (kg/m^3)	3.22	5.52	4.17	4.24	1.42	4.93	1.62	15.18	3.45
[a]PC_1 (kg/m^3)	4.74	53.76	25.41	9.25	17.85	16.58	15.55	11.09	9.19
[b]PC_2 (kg/m^3)	0.36	1.53	0.43	0.350.30	0.33	0.21	0.44	0.25	

[a]Weight per volume of ashes; [b]Weight per volume of sawdust

Table 4. Amount of KOH compared to K_2CO_3, expressed as a percentage.

Wood species	KOH	K_2CO_3
Irvingia gabonensis	9.21	90.79
Celtis zenkerii	0.00	100.00
Albizia zygia	0.00	100.00
Terminalia superba	0.95	99.05
Cola gigantia	0.00	100.00
Cordia millennii	0.61	99.39
Funtumia elastica	0.60	99.40
Ceiba pentandra	0.00	100.00
Ficus exasperate	0.43	99.57

Figure 1: Traditional Potash Extraction setup

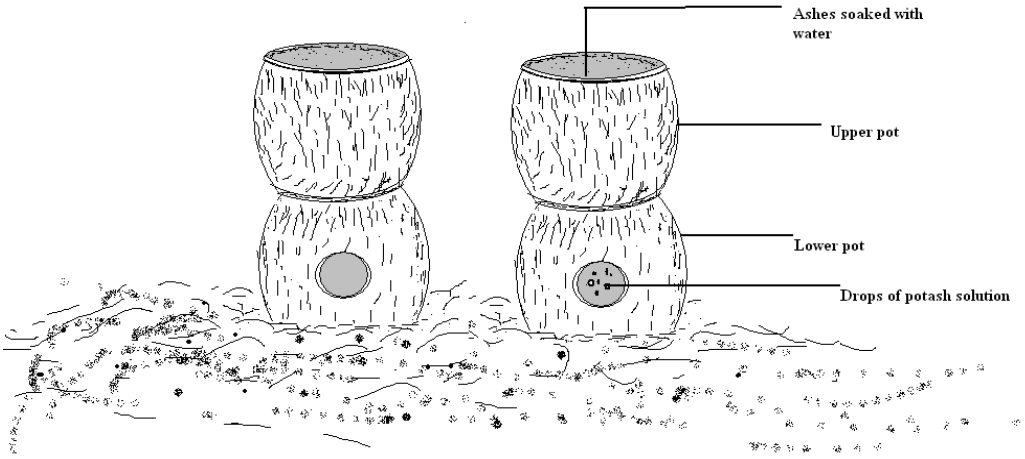
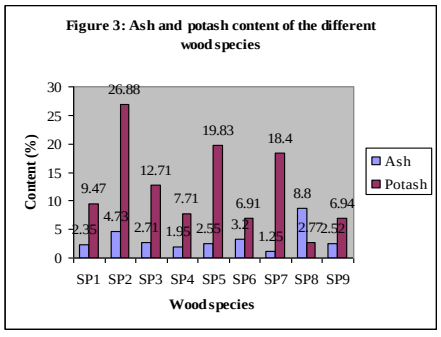


Fig. 2 Laboratory potash extraction set-up (Kevin, 2002)





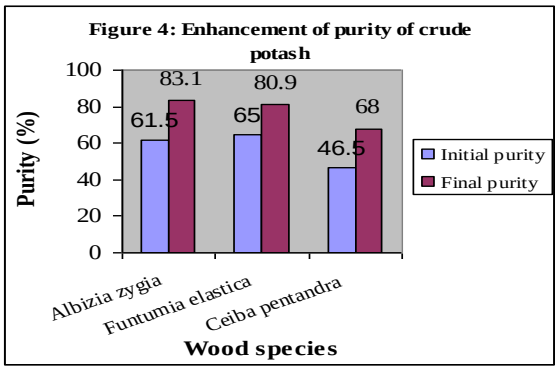
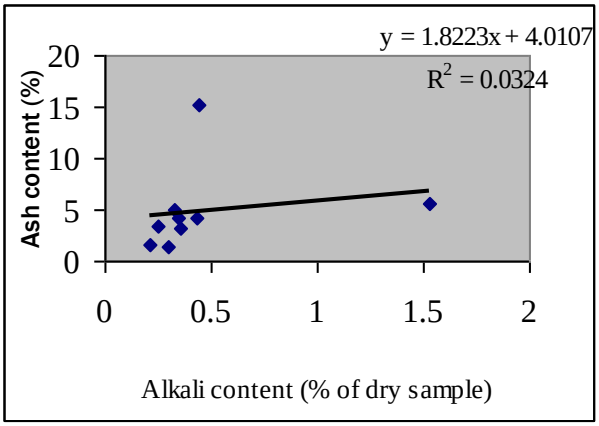


Figure 5: Correlation between ash content and alkali content (% of sawdust of wood samples)



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EXPERT SYSTEM-BASED PREDICTIVE COST MODEL FOR BUILDING WORKS NEURAL NETWORK APPROACH

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ABSTRACT

Project managers need accurate estimate of building projects to be able to choose appropriate alternatives for their constructions. Estimated costs of building projects, which hitherto have been based on regression models, are usually left with gaps for high margin of errors and as well, they lack the capacity to accommodate certain intervening variables as construction works progress. Data of past construction projects of the past 2 years were adjusted and used for the study. This model is developed and tested as a predictive cost model for building projects based on Artificial Neural Networks (ANNs). This model will help professionals save time, make more realistic decisions, and help avoid underestimating and overestimating of project costs, which are some of the advantages over previously used Regression models.

KEY WORDS: Expert-System, Predictive cost, Neural-Network, Cost, Model and Regression.

INTRODUCTION:

A number of uncompleted and abandoned projects are attributable to overall bad projects management of which poor forecasting approach is a factor. Poor cost *forecasting approach will lead to underestimating or overestimating and* consequently cost overrun. Project abandonment as a result of cost overrun arising from poor cost forecasting approach, is an interesting phenomenon locally as well as globally.

This phenomenon has led to various stakeholders in built environment to be aware of importance of accurate project cost right from conceptual stage of building project as well as throughout the life cycle of the project work. The awareness of working with accurate cost has thus created a trend among various clients including private, corporate, as well as public clients (government), that prudency in resources allocation is a great necessity for successful execution of project works. Thus in a bid to have an appreciation of what the project cost should be, clients resort to request for cost implications of various aspect of the project for purpose of planning, so also to have better appreciation of magnitude of project cost and environmental cost implication of the project as well as impact of the projects financial implication on client's and other stakeholders decision. This development led to the advent of forecasting project cost so as to generate project cost information which reveals what the value of a project cost could be in future. However, in providing project cost information, cost estimator often resort to using traditional approach, recent developments on the other hand has proven the fact that traditional approach, which uses historical methods do not tend to capture the details of project works cost components, as well as intervening variables that impacts the cost magnitude. Without gainsaying once the process is faulty, the end result could not be anything less to an incomplete account of project's cost and cost overrun.

The cube method was the first recorded forecasting method; this was invented about 200 years ago, floor area approach was developed around 1920 (Skitmore et al 1990),some researchers later developed storey enclosure method on 1954, which provides better result over the previously developed cube and floor area, certain variables were identified and incorporated into the model other than those used in the past, like floor areas vertical positioning, storey heights, building shape and presence of basement.

However in the mid-1970s, researchers started deploying statistical techniques cost modeling, through these, conventional methods evolved, such as approximate quantities and optimization. Peculiar to the research work in this era is possibility of demonstrating the applicability of the developed models, as a result of seemingly non applicable nature of model generated.

CONCLUSION: The analysis carried out in the study, presents preliminary validation of prospect of obtaining a model that will predict building construction cost with minimum error, and as well demonstrates the applicability of Neural network in forecasting the cost of building work. The result of the analysis indicates high level of accuracy in the output obtained from the neural network model. The model when developed will be simple to use. It is believed that the model will be suitable for use at different stages project work.

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ENVIRONMENTAL PROTECTION POLICY IN NIGERIA: HISTORICAL PERSPECTIVE

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Abstract

Nigeria is the most populous country in Africa. It is also an oil rich nation with diversity of ecosystems. The country is committed to the principle of sustainable development by adopting environmental protection policy. The paper through historical approach traces the environmental policy development in the country. It identifies the policy strategies designed in support of sustainable development. It reckoned that policy impediments are hindrances to environmental sustainability.

Introduction

The environment is man's greatest gift. The environment could be looked at as the basis for man existence. The misuse or misappropriation of the constituents of the environment could hamper the health, socio-economy and peace of a nation. This may leads to state or national security. Thus, it is essential that man should design a way for its sustainability. This can only be achieved through formulation and development of adequate and dynamic environmental protection policy which will engender environmental sustainability.

The Environmental Sustainability as an off shoot of the Principle of Sustainable Development emphasizes the need to meet the needs and aspiration of the present without compromising the needs of the future (WECD, 1987). It can only be midwife by the nation with the support of its citizenry. Sustainable development entails the harmonization of population growth with utilization and exploitation of natural resources through redirection and reorientation of research and development as well as institutional changes (UN-ECA, 2001).

Environmental Policy formulation, adoption and implementation are generally developing concepts that came about in the late 1960. These concepts are still evolving in developing economy like Nigeria when they claimed to be put into force. Whereas compared to the Western world this policy concepts are given expression yielding encouraging results.
This paper shall examine the historical development of environmental policy in Nigeria and also identifies the problems of its implementation. The paper at the end will recommend appropriate strategies that will encourage environmental sustainability in Nigeria.

Conclusion

The paper identifies that Nigeria support the principle of sustainable development by adopting environmental policy that is off shoot of Agenda 21. It realized the impediments to environmental sustainability in policy adoption, policy harmonization, merging of agencies, monitoring and enforcement and institutional capacity. It also surmised that sustainable policy should not be borrowed but expectedly builds and designed at home.
The paper recommends the need for capacity building as an essential instrument in environmental policy development. It suggests integrated approach for policy formulation, adoption and implementation. This is because workable environmental policy is expected to involve state actors and non state actors.

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THE IMPACT OF EXCRETA DISPOSAL INTO LAGOS LAGOON ON THE LAGOON ECOSYSTEM AT *IDDO* DISCHARGE POINT IN *APAPA* LOCAL GOVERNMENT AREA OF LAGOS STATE NIGERIA

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ABSTRACT
This study uncovered possible impacts of discharging raw sewage into the lagoon on the lagoon ecosystems and man in particular. The result of physiochemical and microbiological tests carried out on fish and sixteen water samples taken from *Iddo* in Apapa Local Government of Lagos State, Nigeria revealed pollution. *E,coli, Proteus sp., Enterobacter sp., Aeromonas sp., Klebsiella sp.,* and *Salmonella sp.* were isolated microorganisms identified in the samples. The quantity of Total Solid (802-2711ppm), Dissolved Solids (550-1990ppm), Biochemical Oxygen Demand (59-140ppm), Level of conductivity (120-500µS), colour (5- 10HU), and Nitrate (23-65ppm) found in the water samples also confirmed that the Lagoon environment is insalubrious. Finally, conclusion was drawn with the recommendation that sewage should be treated prior to discharge into any sphere of the environment.

1.1 INTRODUCTION
Waste, either solid or liquid, is an integral part of man. Its generation and efficient management facilitate social, economic and biological development. Amount of waste generated keep soaring as a result of increasing urban population and consequent rapid urbanization, which, in-turn presents greater challenges for disposal and management. The problem is even worst with respect to non-solid wastes since no city in Nigeria has a sewage system worth its name (Lagos State Ministry of Economic Planning and Budget 2004:9).
The concern of this research is on excreta waste being discharged into the Lagos lagoon in relation to the impact on the lagoon ecosystem. According to Longman Dictionary of contemporary English (2003:474) "excreta is the solid or liquid waste materials that people and animals produce and get rid of from their bodies". Excreta contain enteric organisms such as *Klebsiella spp*., *Enterobacter spp*. and *E. coli* that are detrimental to the health of fauna and flora when injected.
Lagoon contains brackish water (water that is slightly salty). This water is regarded as one of the most productive aquatic ecosystem in the world, and is of great socio-economic importance (Kiener, 1978 cited in Lalèyè and Moreau, 2005:28). According to Lalèyè and Moreau, (2005:28), Durand *et al* (1994) categorised the fish fauna in West Africa lagoons into (a) the littoral *euryhaline* marine species which come seasonally or accidentally into the lagoon; (b) the estuarine species which live usually in *mixohaline* inland waters; and (c) the continental or inland water species that are only scarcely recorded in the lagoon as they can enter them only when the water became fresh. Out of three hundred and thirty two fish (332) species belonging to the three categories of fish indicated above, seventy-nine (79) species have been identified in the Lagos lagoon. This is a vindication that Lagos lagoon provides substantial quantity of aquatic foods in the sub-region; however, mutilating its physico-chemical and biological structure portends significant socio-economic and health implications.
Lagos lagoon is being polluted in its entirety of because one anthropogenic activity or the other that takes place at the littoral areas due to population pressure. However some points are more populated and received more pollutants than others receives. *Iddo* in Apapa Local Government and *Ebute-ero* in Lagos Island Local Government areas are two principal points know for high population concentration. In these two areas, there are excess organic nutrients, because raw human faeces are discharged into the lagoon without treatment. Thus, deterioration of the quality of water ensues and all signs of water pollution are obvious. At *Ebute-Ero* littoral areas, a number of illicit and insanitary toilets known as "overhung latrines" have been constructed, where in shoppers, passers-by, and traders defecate directly into the lagoon under poor hygienic condition.

Lagos residents who intend to dispose of their septic tanks hygienically succeed in polluting the lagoon through excreta waste handlers who dutifully evacuated and discharged feacal effluents into the lagoon without treatment with the use of itinerant tankers. The raw faecal effluent present in the lagoon is oxygen demanding, it can only be decomposed by aerobic (oxygen-requiring) bacteria. The presence of these bacteria in large number perhaps to detoxify excreta waste degenerate water quality by reducing the quantity of oxygen, and therefore, leading to massive demise of aquatic animals.

Untreated excreta wastes contain myriads of disease-causing agents (pathogens) which include bacteria, viruses, protozoa, and parasitic worms that eventually get to biological system of fish and other aquatic animals consumable by man. Through this process feacal-oral diseases are transferred to man unfettered. WHO, (1992:16) declared that four million infants and adults die every year from diarrhea diseases, largely as a result of contaminated food or water.

Akpata and Ekundayo (1978), Helasi-kun (1981), cited in Ajayi and Akonai (2005:163) asserted that the discharge of raw sewage into the lagoon has important health implications. This insanitary act is facilitating the spread of feaco-orally transmitted sanitation related diseases. Infections such as diarrhea, cholera, and typhoid that account for significant mortality are contracted through house flies, contaminated hands, food, and water, eating and cooking utensils. It is not difficult for edible materials to be exposed to faecal matter in Lagos metropolis, because the polluted lagoon account for more than 70 per cent of fish and other sea foods consumed daily by Lagosians. Therefore eating fish caught in the polluted Lagos lagoon increases the risk of contracting feaco-oral diseases.

The main thrust of this paper is to examine the ecological impacts of discharging raw sewage into the lagoon with a view to identifying most healthy and sustainable approach

SUMMARY

The outcome of the test conducted on water samples from *Iddo* Jetty showed that the pH value (7.9 to 8.9), recorded was still within acceptable standards for normal brackish water environment, but it is tending towards alkaline. Although aquatic organisms can still inhabit the lagoon environment with negligible impacts at present; the intractable discharge of raw excreta portends environmental dangers in close future. Other parameters tested were higher, total Suspended Solids (TSS) recorded ranged from 2412ppm to 2815ppm. Total dissolve Solid (TDS) was higher than 1990ppm. Conductivity was 310 uS to 510 uS; these confirmed that excessive quantity of both suspended and dissolved matter were present in the lagoon, and thereby made the lagoon water to be turbid, coloured and facilitate abnormal conduction of electricity.

Laboratory tests conducted on water and fish during these quests revealed that the water in the lagoon around the jetty is harmful to aquatic, terrestrial, and arboreal fauna and flora that constitute the lagoon ecosystems. The laboratory analysis revealed that E, coli, Proteus sp; Enterobacter sp; Aeromonas sp; Klebsiella sp; and Salmonella sp. had became inseparable member of the lagoon ecosystems due to contamination by fresh raw faecal effluents.

1.7 RECOMMENDATIONS.

Having established the fact that insanitary disposal of untreated faecal matter into the lagoon have negative impacts on the Lagoon ecosystem and subsequent man, it is human to suggest ways that could facilities proper management of excreta to obliterate environmental impacts associated with raw faecal contamination.

The existing policy guidelines at Federal, State and Local tier of government should be given “teeth” to facilitate coercion and compliance; so as to develop a milieu where preventable diseases would not be a hindrance to socio-economic development. Therefore, fund that supposed to be expended on developmental projects of any kind would not be employed in procuring medications for curing diseases that are preventable. Therefore, we would have abide by the sage that “prevention is better than cure”.

Public awareness campaign on the evil of insanitary collection and disposal of faecal matter should be heightened to curb incessant dumping of excreta waste into the lagoon to the tune of causing disease that can impair public health. There is need for government to reinvigorate health professional in charge of preventing disease, especially, Environmental Health Officers. They are generally concerned with public health surveillance and the protection of the environment as it affects health. The reinvigoration of the profession would facilitate proper monitoring of the environment to curb indiscriminate dumping of wastes; and also empower Environmental Health Officers to prosecute any erring resident to serve as deterrent to others.

Sewage treatment plants at Ikeja, Abesan Housing Estate, 1004 Housing Estate, FESTAC Town Housing Estate, and many others in Lagos City that are dysfunctional should be revitalized, so that faecal matter can be sanitarily treated and associated infections obviated. Private investors could also be invited to build sewage treatment plant at *'Iddo'*. This is borne out of that fact that the jetty is the point where the highest volume of raw excreta is being discharged into the Lagos Lagoon

Prior to getting an investor, there is still a provisional way out of discharging raw feacal matter into the lagoon without treatment. There is a canal adjacent The National Art Theater, Iganmu that can be modified to suit deposition of feacal matter, and here feces can be treated biologically before onward release into the lagoon through soil pipes.

Considering our level of economic and technological development, we can still do with the present system of evacuation and discharge of raw feces. That is septic tank with soak-away system and ventilated improved pit latrines. But evacuated feces should be treated either biologically or otherwise prior to discharge into any parts of the sphere.

CONCLUSION

The results of the physicochemical and microbiological properties of the water samples taken from *'Iddo'* are quite out of range of the Secondary Maximum Contaminant Levels (SMCLs) for aquatic to feed and grow well. The fish samples contain trace of microbiological substances according to the laboratory tests conducted; by inferences it will also contain physicochemical parameters, which are deleterious to lives. Therefore, the lagoon is polluted. Therefore, consuming any of its food can cause infections in the pray.

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THE UTILIZATION OF CITRUS PEEL FOR PECTINASE PRODUCTION

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ABSTRACT
Due to the ever-growing costs for water and energy worldwide investigations are carried out to substitute conventional chemical processes by environment-friendly and economically attractive bioprocesses using enzymes. Here, a successful strategy for the use of enzymes in various industries. The fruit processing industries produce a large amount of waste material, which poses considerable disposal problems and ultimately leads to pollution. In the processing of citrus fruits, a large proportion of the produce goes waste in the form of peel, pulp and seeds. Dried citrus peel is rich in carbohydrates, proteins and pectin; pectin acts as the inducer for production of pectinolytic enzymes by microbial systems. Thus, in the present study, dried citrus peel was used as substrate for the production of pectinase. . Pectin, a polymer of galacturonic acid residues connected by α-1, 4 glycosidic linkages, being the main component of middle lamella of plant cell wall. Pectinase enzyme hydrolyse pectic substances into sugar which can be used for food and value added products. Pectinase are industrially important enzymes and have potential applications in fruit, paper, textile, coffee and tea fermentation industries. Pectinases are either intracellular or extra cellular. Although a large number of micro-organisms can degrade pectin. Keeping in view, the demand of new enzymes some micro-organism capable of pectinase production are being isolated and studied.
Key words: - Pectinase enzyme, applications, isolation

INTRODUCTION

Citrus fruits constitute an important group of fruit crops produced all over the world. India is also a major producer of citrus fruits. These are produced all over India, but the major producers are the states of Maharashtra, Tamil Nadu, Andhra Pradesh, Himachal Pradesh, Punjab and Haryana. Oranges of Nagpur are famous for their size and aroma. Citrus fruits are utilized mostly for table purposes, but a significant portion is processed into various products, such as squashes, cordials, single strength juices, juice concentrates, marmalades, pickles *etc*.The family of citrus fruits consists of Oranges, Kinnow, Khatta, Lime, Lemon (Galgal),Grapefruit, Malta, Mausami, Sweet orange etc. These all are known to contain appreciable amounts of pectin. Pectic substances are present in the primary plant cell wall and the middle lamella. Besides these, other fruits like Mango (*Mangifera indica*), Avocado Pear(*Avocado avocado*), Guava (*Psidium guajava*), Banana (*Musa sapientum*), Papaya (*Caricapapaya*), Cashew Apple (*Anacardium occidentale*), Garden-egg (*Solanum nigrum* Linn.),Star Apple (*Crysophylum albidium*), and Tomato (*Lycopersicum esculentum*) also contain substantial amounts of pectin having a high gelling grade . Sugar beet pulp, a by-product of sugar extraction, also contains Fruit processing industries produce a large amount of waste material in the form of peel, pulp, seeds, etc. Some fresh orange peel is, however, used in shredded form in the preparation of orange-marmalade. This waste material presents considerable disposal problems and ultimately leads to pollution. Dried citrus peel is rich in carbohydrates, proteins and pectin; the fat content, however, is low. Various microbial transformations have been proposed for the utilization of food processing waste for producing valuable products like biogas, ethanol, citric acid, chemicals, various enzymes, volatile flavouring compounds, fatty acids and microbial biomass . Citrus peel contains an appreciable amount of pectin and thus can be used as a substrate for the production of pectinolytic enzymes by micro organisms. Pectin acts as the inducer for the production of pectinolytic enzymes by microbial systems .The advantage of using micro organisms for the production of enzymes is that these are not influenced by climatic and seasonal factors, and can be subjected to genetic and environmental manipulations to increase the yield. Highly productive strains of micro organisms are required at the industrial level to reduce the production costs .Strains obtained by crossing high and low polygalacturonase hetrokaryons of *A. niger* have been reported to exhibit higher activities than the parent strain. Different types ofmicroorganisms have been exploited for the production of enzymes. Pectinolytic enzymes have been reported to be produced by a large number of bacteria and fungi such as *Bacillus* spp., *Clostridium* spp., *Pseudomonas* spp., *Aspergillus* spp., *Monilla laxa*,*Fusarium spp.*, *Verticillium* spp., *Penicillium* spp., *Sclerotinia libertiana*, *Coniothyriumdiplodiella*, *Thermomyces lanuginosus*, *Polyporus squamosus*, *etc*

Pectinases are a heterogeneous group of enzymes that degrade pectin. These are widely used in the food industry for the production and clarification of fruit juices, to improve the cloud stability of fruit and vegetable juices and nectars, for depectinization in order to produce high density fruit juice concentrates, and for haze removal from wines Pectic enzyme preparations are also used for the production of low methoxypectin for diabetic foods, in the degumming of natural fibers in the textile industry, and in making commercial softwoods, such as Sitka and Norway spruce, more permeable to preservatives . Purified pectinases have also been developed specifically for use in plant protoplast culture studies. When used with cellulase, purified pectinases have been found to be very useful for generating good yields of viable protoplast in several plant systems, *e.g.* corn, soybean, red beet, sunflower, tomato, citrus *etc*. Commercial enzymes are generally obtained from fungal sources since the pH optima of these enzymes are in the range found naturally in materials to be processed and the enzymes are secreted into the culture media, making the downstream processing easier. Keeping in view the importance of enzyme pectinases in the food processing industry and the problems associated with the disposal of food processing industry waste, the present study was undertaken with the objectives of utilizing citrus peel for the production of pectinase .

Enzyme production is a growing field of biotechnology and the world market for enzyme is1.5 billion and it is anticipated to double by the year 2008.The majority of the industrial enzymes are of microbial origin. In the present study ,eighty five isolates were isolated from different places. These isolates were grown at different temperature and pH to be able to produce a polygalacturonase which favourable to be used as additive for clarification of juice. A screening of pectinolytic productivities of the isolates showed that many of them gave good pectinolytic productivities. The nature of solid substrate is the most important factor in solid state fermentation. This, not only supplies the nutrient to the culture but also serve as anchorage for the growth of microbial cell. The selection of substrate SSF depends upon several factors mainly with the cost of availability and this may involve the screening of several agro-industrial residue. An optimum substrate provides all necessary nutrients to the micro organism for optimum function. However, some of the nutrients may be available in suboptimal concentrations or even not present in the substrate In such cases, it would be necessary to supplement them externally. Indeed 30-40% of the production cost for industrial enzymes is accounted for the cost of the culture medium. In order to reduce medium costs we screened different low cost substrate and in the course of this we identified citrus peel for cost effective production of the enzyme under study. SSF is receiving a renewed surge of interest, primarly because increased productivity and prospect of using a wide agro industrial residue as substrate. From industrial point of view, in order to achieve production of low cost of enzymes, these isolates under study were allowed to grow. The selection of the substrate for the process of enzyme biosynthesis was based on the following factors i.e. 1) they represent the most cheapest agro-industrial waste. 2) They are available at any time of the year. 3) Their storage represents no problem in comparison with other substrate. 4) They resist any drastic effect due to exposure to other environmental conditions e.g. temperature variation in the weather from season to season and from day to night.SSF are usually simple and can use waste of agro-industrial substrates for enzyme production . The minimal amount of water allows the production of metabolites, less time consuming and less expensive.

Higher production of pectinase in SSF process may be due to the reason that solid substrate not only supplies the nutrient to the microbial culture growing in it, but also serves as anchorage for the cell allowing them to utilize the substrate effectively. The environmental conditions in SSF conditions can stimulate the microbe to produce the extra cellular enzymes with different properties other than those of enzymes produced by same organism under the conditions performed in submerged fermentation. In this field many workers dealt with the main different factors that effects the enzyme productions such as temperature, pH, aeration, addition of different carbon and nitrogen sources .Although such factors were previously studied. Still we need for more investigation seems to be continuously required to give a chance to isolate more.

The present work is to determine the optimum conditions for the enzyme. On the other hand, the economic feasibility of the microbial enzymes production application generally depends on the cost of its production processes. In order to obtain high and commercially viable yields of pectinases enzyme, it is essential to optimise the fermentation medium used for growth and enzyme production. Optimal parameters of the pectinases enzyme biosynthesis from microbial origin, varied greatly, with the variation of the producing strain, environmental and nutritional conditions

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FISH PRODUCTION, SUSTAINABLE DEVELOPMENT AND THE AQUATIC ENVIRONMENT

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Abstract
During the past three decades, fish production (especially aquaculture) has expanded, diversified, intensified and made technological advances. The potential of this development to enhance local food security, alleviate poverty and improve rural livelihoods has been well recognized. However, the need for this sector to develop full potential, and make a net contribution to global food availability, domestic food security, economic growth, trade and improved living standards may not be emphasised without paying attention to the health of aquatic environment. The health of aquatic environment is essential to maintaining fish harvest and production levels in the face of increasing demand. This paper x-rays the prevailing fish production practices and their impacts on the environment. It concludes by proffering solutions and guide for producing fish that will enhance sustainable development and healthy environment.

Key Words: Fisheries, Aquaculture, Water Environmental, Food Security

Introduction

From ancient times, fishing has been a major source of food for humanity and a provider of employment and economic benefits to those engaged in this activity. However, with increased knowledge and the dynamic development of fisheries, it was realized that living aquatic resources, although renewable, are not infinite and need to be properly managed, if their contribution to the nutritional, economic and social well-being of the growing world's population was to be sustained (FAO 1997a).

The notion of sustainable development was first advocated in 1987 by the World Commission on Environment and Development (WCED). One of the tasks of this commission was to re-examine the critical issues of environment and development and formulate innovative, concrete and realistic actions proposals to deal with them (Ogunji et al. 2003). It was in the report submitted by this commission tagged "our common future", that the concept of sustainable development was put forward. It was defined as the "development that meets the need of the present without compromising the ability of future generations to meet their own needs". The report clearly indicated that the attainment of sustainable development deal with the interrelationship between the global environment and development in a very comprehensive manner. According to Ryding (1994), the concept of sustainable development may be separated into critical load/levels (i.e., the burden on the environment) on the one hand, and carrying capacity or safe yield (i.e., safe guard productivity, in the long run) on the other hand. The sustainable development should be seen as the key to understanding the relationships between environment and development. This is important because development in all its ramifications cannot be isolated from the environment. Humans have an undeniable reliance on natural resources to sustain their endeavours. This development is undetermined without adequate environmental protection and resources will be inadequate for needed investment.
It should be noted that the health of aquatic environment is essential to maintaining sustainable fish harvest and production levels in the face of increasing demand. This paper looks at the prevailing fish production practices and their impacts on the environment. It concludes by proffering solutions and guide for producing fish that will enhance sustainable development and healthy environment.

Fish husbandry and capture fisheries
Fish is the most important single source of high quality protein, providing 16% of the animal protein consumed by the world population (FAO 1997b). It is particularly an important protein source in the region where livestock is scarce. Fish supplies more than 10% of animal protein consumed in North America and Europe, 17% in Africa, 26% in Asia and 22% in China, one billion people worldwide rely on fish as their primary source of animal protein (FAO 2000b).

In 1970 the apparent world average food fish per caput consumption was estimated at 10.9 kg/year. It increased to 13.6 in 1989 and declined to 13.0 Kg/year in 1993 (Josupeit 1994). Based on the information available in August 2006, FAO has calculated the apparent world average food fish per caput consumption in 2007 as 16.4 Kg/year (FAO 2007). It can be seen that the change in growth has not been continues but that changes have existed. Interestingly current data has been the highest for quite a long time. At the moment the world population is 6 billion and it is expected that by the year 2030 it will exceed to 8 billion and the consumption of fish and sea food at that time is predicted to reach between 150-160 million tonnes (FAO 2000b).

Western Europe is the main fish consuming region among developed countries with a fish per – caput supply 30.5 Kg/year. Faeroe Island and Iceland situated in this region recorded the highest per-caput fish supply as follows: Faeroe Island 87.5 and Iceland 91.4 Kg/year. Northern America 22.7 Kg/year and Oceania (Australia and New Zealand) 22.9 Kg/year recorded lower supply. Maldives has over the years become a country with highest per-caput fish supply in the world. It was 130 kg/year in 1990 and 190Kg/year currently (FAO 2007). Practically fish is the only food that does not have to be imported and it is a staple food in this country.

In Nigeria, a major motive for embarking on fish farming is for the production of animal protein for man's consumption. The per capita consumption of animal protein stands at 28.0kg /annum and of these, 10.6kg or 37% is derived from fish. Current demand for fish in the country is 1.5 million metric tonnes, local production from all sources currently stands at 550,000 metric tonnes while about 700,000 is imported at a total cost of US $ 500 million annually (Ruma, 2008).

Protection and Conservation of Fish Resources/ Conclusion

Fish is used here in its widest sense to include fin fish and other exploitable aquatic animal resources, such as crayfish, molluscs and aquatic vertebrates. This is because the life of one has bearing on the life of others. For example, the crayfish (crustacean) may be eaten by a fish, which in turn may be consumed by a crocodile whose droppings fertilize the water body and enable phytoplankton to grow. The phytoplankton may be eaten by other organisms, which are food for the crustacean. Thus, in order to regulate the sustainable exploitation of fish resources, it must be understood clearly why and how this can be achieved.

Ezenwaji (1997) strongly suggests that conservation of fish resources is necessary because of the following:

a) The life of a fish species affects the life of others, so in order to preserve the ecological balance all organisms must be protected. This helps to maintain biodiversity.

b) If the fish resources is depleted our children will not know about them.

c) Fish resources are not inexhaustible; they are finite and so could be completely decimated. This is already happening.

d) If juvenile fish are not harvested, they grow to become big fishes, which can reproduce before exploitation. The good news is that given the right conditions, most fish resources can recover easily. Therefore, it is important to consider how to make this happen and how to conserve those approaching extinction.

Further more fish resources according to Ezenwaji (1997) can in simple terms be easily replenished by:

a) Avoiding overfishing. This can be achieved by using appropriate mesh sizes, not less than 3" (about 7.5 cm) for fish, which grow to large size. Of course we realize the problems of multispecies fishery but exploitation of each species or group of species could be done at the appropriate time.
b) Avoiding the use of obnoxious methods such as explosives, chemicals and ichthyotoxic plants.
c) Avoiding exploiting fish on their spawning run or migrating fries and juveniles.
d) Providing sanctuaries or protected areas for the fish resources
e) Breeding fish, which are near extinction and restocking in their natural habitats.

The points outlined above are by no means exhaustive, other management options based on indigenous knowledge, can be proffered but this makes it possible for the enormous task ahead to be appreciated. Accomplishment of the task requires sacrifice and discipline. It also requires appropriate and sustained education.

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PROSPECTS AND CHALLENGES OF COMPRESSED STABILIZED LATERITE BRICKS IN ENHANCING SUSTAINABLE HOUSING DEVELOPMENT IN NIGERIA

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ABSTRACT
Sustaining housing development especially to the medium/low-income group of the society has become a huge challenge particularly because of the huge capital outlay required to do so. Thus, acquisition of indigenous building materials by way of Compressed Stabilized Laterite Bricks (CSLBs) has been suggested as a way out.
This paper evaluated CSLBs as a building material for sustainable housing construction. The study focused primarily on evaluating its physical properties as a building material as well as a measure of its level of acceptability for housing construction among the populace. The study was carried out in four local governments namely; Ogbomoso North, Ibadan Southwest, (in Oyo State) Ado-Odo Ota, (Ogun State) and Agege Local Govenment in Lagos State, Nigeria.
The methodology adopted was survey method which involved the administration of 600 questionnaires on randomly selected household heads out of which 551 responded. The data obtained was analyzed using various statistical tools.
The result showed that there is apathy towards acceptability and use of CSLBs for housing construction due to lack of knowledge about its physical properties. It was also found out that non-availability of CSLBs in the open market was a major determinant of the apathy.
The paper concluded that to ensure sustainable housing development via CSLBs, there must be continuous sensitization of the populace by stakeholders through construction of model houses with CSLBs. More researches on fabrication and production of the CSLBs making machines so as to make it more readily accessible should also be funded.

Keywords: Acceptability, Compressed Stabilized Laterite Bricks, Housing, Housing construction.

Introduction

The importance of housing in human history cannot be overemphasized. Housing is seen as one of the best indicators of a person's standard of living and of his or her place in society (UNCHS, 1993). Furthermore, Venkatarama Reddy (2004) is of the view that housing and building conditions also reflect the living standards of a society. Thus, the importance of access to adequate and affordable housing took the front burner in the mid 20th century. The low-income group whose population is on the increase due to rapid urbanization and population growth evidently became the most vulnerable in terms of lack of access to decent and affordable housing in developing countries. This has led to various researches into development of locally available building materials and construction techniques to enhance access to housing for all.
In 1976, the Human Settlements conference in Vancouver gave new impetus to this approach, condemning the transposition of Western building techniques for low-cost housing and recommending the design of technologies suited to climatic, social and cultural contexts (Rigassi, 1985). The conference also recommended the gradual reduction of imports of products and services linked to construction, and the drawing up of norms and regulations which covered the basic needs of end-users whilst taking account of their economic possibilities.

The acquisition of local building materials and techniques to guarantee access to decent and durable housing for all by the year 2000 was adopted in December 1988 by the General Assembly of the United Nations with the slogan "Global Strategy for Housing to the year 2000". The Assembly proposed relying on a vast formal and

informal private sector participation in housing provision. This strategy was aimed at removing the dependence on the public sector for housing provision by exploring the erstwhile ignored wealth of existing human resources and their building cultures and social dynamics.

The building culture of pre-independence Nigeria was an absolute dependence on earth building techniques such as use of adobe bricks (sun-dried bricks) and wattle and daub (mud wall construction). These techniques were predominant in major rural and semi-urbanized towns and cities in Nigeria. These techniques were durable, adequate and accessible enough for them to meet their housing needs. The techniques were also sustainable since they do not deplete the natural resources of the environment neither do their production processes lead to the emission of gases that causes global climate change.

However, post-independence rural centres in Nigeria acquired new status as a result of independence on October 1, 1960. This period was immediately followed by the "oil boom" of the 1970 and 1980 which brought about an unprecedented prosperity and development of the nation. There were massive improvements on infrastructural development particularly in state capitals and major cities and towns. Thus, the towns became increasingly urbanized and became an urban-oriented society. The crave for Western building techniques led to the gradual extinction of the erstwhile earth building techniques. Thus, while other countries were developing various earth building techniques to meet the housing needs of their populace, the technique became associated with the poor in Nigeria and not fashionable for housing purposes.
The paper examined the current housing situation in Nigeria vis-a-vis the reasons that led to the gradual extinction of earth building technology in the study area. The paper also examined the potentials of CSLBs as a sustainable alternative which has sufficient production flexibility to enable it to be integrated into both formal and informal sectors of building activity (Rigassi, 1985).

The paper concluded that CSLBs is a sustainable construction technique. It is affordable, durable and accessible. It was however observed that there is an apparent apathy towards its use due to lack of knowledge about its physical and socio-economic properties. Respondents are of the opinion that concerted efforts have to be put in place to sensitize the populace about its applicability in building construction. This could be done by encouraging public-private sector participation in constructing public houses with CSLBs in major cities of the country. Continuous researches that will encourage the use of CSLBs should also be encouraged through construction of prototype houses across the country.

Conclusion

The study established from literature that CSLBs is a sustainable and cheaper alternative to sandcrete blocks. The field study also shows clearly that CSLBs being a derivative of earth building technology is not associated with the poor. The paper concluded that the aspiration of home ownership by majority of respondents could be explored to market the acceptance of CSLBs for affordable housing construction through adequate promotion and enlightenment campaigns by the public-private sector in Nigeria.

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AN INTEGRATED APPROACH TO PLANNING AND DEVELOPMENT OF SUSTAINABLE AFFORDABLE HOUSING IN DEVELOPING COUNTRIES.

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Abstract
Every human being deserves a decent and healthy living condition regardless of their socio-economic status. While there is no single panacea that will eradicate poverty world-wide, there are innovative ways, however, to improve the living conditions of low-income people by making their built environment sustainable. Sustainability, in form of green construction practices has gained wide popularity in United States and a host of other developed countries. These practices have been implemented in the construction of affordable housing where results have translated into healthy living environment. Despite the documented evidence of benefits of sustainable construction practices across the globe, many developing countries still lag behind in adopting the concept. In fact, several scholars and proponents of sustainability studies have argued for and against the adoption of foreign-based sustainable construction practices in developing countries.

One issue is whether sustainable construction practices can be successfully adopted in developing countries without adequate consideration of their economic, environmental, social, and political imperatives. In spite of these concerns, development of decent and healthy housing for the low-income masses must remain a top priority. Housing development for the low-income should not be undertaken without proper consideration for the environment and well-being of the occupants. This can be realized using integrated approach during the planning and development stages. Thus, this paper focuses on how to plan, design, and develop sustainable "green" affordable housing using integrated and holistic approach.

Introduction

There is no ending in sight to the rate at which the world population is growing. In 1999, it was reported that world population reached an overwhelming 6 billion people. At this growth rate, it was further predicted that world population could reach 7 billion by year 2010 (Paudel & Lobovikov, 2003). In 2003, the UN-Habitat estimated that 928 million people live in slums (Cited in Okwo & Soboyejo, 2006). At the same time, studies show that intervention programs designed to address poverty alleviation has not kept pace with population growth in developing countries. The number of available housing still falls behind the population who needs shelter. Paudel and Lobovikov (2003) linked the implications of increased poverty in developing countries to "lack of shelter" (p. 1).

There is no doubt to the fact that inadequate housing has been an on-going global challenge for many years. This acknowledgement has been documented by many academic housing researchers and affordable housing advocates. No part of the world is this problem more pronounced than in the developing countries (Okwo & Soboyejo (2006). The majority of world's poor and disadvantaged population lives in developing countries where lack of adequate resources and modern technology to address the situation is a familiar norm. In most cases, these problems are compounded by the political, economic and social policies of the government. For example, Nigeria did not recognize the need or social obligation to provide adequate housing for its citizens until during the 3rd (1975-1980) and 4th (1981-1985) National Development Plans. It was during these periods that Nigeria finally "accepted housing as part of its social responsibility" (Oruwari, 2006, p.33).

Even with that, housing construction budgetary allocation was abysmally low. Some state government policies were also found to be counter-productive to the housing innovation processes (Lasisi & Adedipe, (2006).

UN-Habitat describes adequate shelter as one that provides "adequate privacy, adequate space, physical accessibility, adequate security, security of infrastructure, suitable environmental quality, health-

related factors, and adequate and accessible location with regard to work and basic facilities." (cited in Okwo & Soboyejo, 2006, p.2). A careful analysis of this definition indicates that "adequate shelter" must be sustainable. In addition to being sustainable, adequate shelter must also be affordable. A non-sustainable shelter will not fall within the scope of the definition.

The UN-Habitat broad definition of adequate shelter has been validated by many scholars. Winston and Eastaway (2007) indicate that "housing is an essential component of both quality of life and sustainable development" (p. 1). The authors link quality of life to various aspects of one's home. They argue that the conditions of one's home is "essential for quality of life, including structural and design elements, such as damp-proofing, sound-proofing, and energy efficiency" (p. 2). Koebel (1999) also links "adequate shelter" to sustainable housing construction practices. He argues that for sustainable residential development to be environmentally sensitive, houses must be built to quality standard with efficient use of material resources, while at the same time providing energy efficiency and comfort to inhabitants. He also maintains that sustainable buildings "must be designed to be adaptable to change in use"(p. 76).

Achuenu and Achuenu (2006) also contend that housing should be more than mere shelter. They argue that housing should provide necessary "ancillary services and community facilities" necessary for human well-being. Likewise, Aroni (1977) as cited in Achuenu and Achuenu (2006) stated that "housing should be a home, a resting place with the fundamental purpose of a secured, rewarding, happy or at least a livable life" (p.427).

It is clearly understood from the above arguments that the primary objective of any sustainable housing development is to improve human conditions and the well-being of the ecosystem. To achieve this objective, attention should be focused on effective integrated planning and development techniques that will lead to successful project..

Conclusion

Housing plays an important role in improving the health and quality of lives of people. The health and well-being of people are affected by the buildings in which we live and work. Government should do more to provide decent and sustainable affordable housing to the low-income masses. In order to embrace the concept of sustainability, sustainable affordable housing should be planned, designed, and developed using Integrated Design Process where the entire building systems are considered holistically, rather than individually. Developing countries must also begin to evaluate the possibility of establishing a Green Building Commission whose initial purpose will be to develop green building rating system for the country.

It takes special skills and knowledge to undertake any kind of green projects. Thus, green affordable housing developers must be knowledgeable in different construction delivery systems, and must possess strong management skill to undertake complex housing projects.

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SUSTAINABLE AGRICULTURE AND CLIMATE CHANGE

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ABSTRACT

There is growing recognition in the human dimensions research community that climate change impact must take into account the reflects of other ongoing global changes. Climate change is no more an environmental concern it has emerged as biggest developmental challenge for the planet.The human society with present day weather conditions is seized with the problems of possible climatic changes in near future. The whole international community is scared of catastrophic adverse effects of future climatic changes on different spheres of man and nature, e.g.. deglaciation and sea level changes, submergence of islands, nations and major coastal lowlands, atmospheric dynamics including evaporation and precipitation, global radiation balance, photosynthesis and ecological productivity, plant and animal community and many more. This paper tries to examine the adverse impacts of climatic changes on the agricultural system. As agriculture represents the core part of the Indian economy and provides food and livelihood activities to a bulk of the population. The agriculture sector represents 35% of India's National Gross Product GNP) and as such plays a crucial role in the country's development. The impact of climate on agriculture could result in problems with food security and may threaten the livelihood activities upon which much of the population depends and thrives. In a country like India where more than 70% of population is dependent on agriculture, it is imperative that the effect of such drastic changes in environment is studied. Also it is equally important that we rely more on scientifically proven facts about global climate changes rather mere conjectures and exaggerations. This paper also endeavours to find out the ongoing and emerging threats on agriculture posed by supposedly so called Climate change. Agricultural system must be sufficiently sustainable to provide for the needs of inexorably expanding populations with greatest growth in urban communities while rural producers proportionately decline. However sustainable agriculture wholly dependent on fertile arable land safe water disastrously degraded, wasted and misused. Arable land and unpolluted water are fast becoming the main determinants of future sustainable agriculture. Climate change is supposed to exert a crucial and negative effect on the mechanism of monsoon, which is the crux of Indian rainfall and precipitation.

INTRODUCTION

Climate is changing naturally at its own pace, since the inception of the evolution of earth, four –five billion years ago, presently but it has gained currency and momentum on account of inadvertent anthropogenic disturbances. This rapidly changing phenomenon may culminate in adverse impact on human health and biosphere on which we depend. The multi-faceted interactions among humans, microbes and the rest of the biospheres have started reflecting quantum increase in the concentration of the green house gases i.e. Carbon dioxides, Methane and Nitrous Oxides, causing warming across the globe along with other cascading consequences in the form of glacier melting, sea level rise, submergence of coastal regions, islands, shift in the rainfall pattern and other catastrophic events. The above multifarious interactions among atmospheric compositions, climate change and human, plant and animal health need to be scrutinized and probable solutions to the undesirable changes may be sought.

Agricultural sector is one of the sensitive areas which would be influenced by the projected global warming and associated climate change. In spite of the uncertainties about the precise magnitude of climate change on regional scales, an assessment of the possible impacts of climate changes in key climate elements on our agricultural resources is important for formulating response strategies. In this paper vulnerability of agricultural sector by ongoing climate change is examined. Climate change and agriculture are interrelated processes both of which take place on a global scale. The atmospheric conditions determine the carrying capacities of the biosphere to produce enough food for the human population and domesticated animals. Despite technological advances, such as improved varieties, genetically modified organisms and irrigation systems, weather is still a key factor in agricultural productivity, as well as soil properties and natural communities. For example, weak monsoon rains in the year 1987 caused large shortfalls in crop production in India, Bangladesh and Pakistan, contributing to a reversion to wheat importation by India and Pakistan (World food Institute, 1988). The last two decades have also witnessed a continuing deterioration of food production in Africa, caused in part by persistent drought and low production potential, and international relief efforts to prevent widespread famine. At the same time agricultural trade has also grown dramatically and now provides significant food supplies for major importing nations and substantial income for exporting nations. These examples emphasize the close links between agriculture and climate, the international nature of food trade and food security, and the need to consider the impacts of climate change in a global context. The effects of climate on agriculture are related to variability in local climates rather than global climate patterns. The earth average temperature has increased by one degree F in just over the last century.

Research on the impacts of climate change and vulnerability on agriculture is a high priority in India as the impact, if it follows the predictions, is expected to be widespread and severe. Developing the ability to confidently estimate the impacts of climate change on agriculture is critically important. If ever achieved, it could provide the global information needed to help farmers develop their own long- range response to climate change. Fortunately, we are very near to have such a capability, and it may take 5-7 years to substantially improve the revolution and accuracy of the climate model and evaluate the implications for agriculture.

I focus on India's agricultural vulnerability to two stressors: climate change and economic globalization. Among India's population of more than one billion people, about 68% are directly or indirectly involved in the agricultural sector. This sector is particularly vulnerable to present -day climate variability, including multiple years of low and erratic rainfall. Scenarios generated by global circulation models show that India could experience warmer and wetter conditions as a result of climate change, particularly if the summer monsoon becomes more intense and stronger (Mitra 2002) . However increased rate of evapotranspiration due to the higher temperatures may offset the increased precipitation, leading to negative impact on soil moisture. There are also considerable uncertainties associated with climate model projections of tropical monsoon behaviour, and simulations that include sulphate aerosol forcing indicate decreasing summer monsoon rainfall (Bagla, 2002) Although the direct temperature and Carbon Dioxide effects of climate change may lead to productivity increases for some irrigated crops, there is a general consensus that major agricultural production areas are likely to be adversely affected by climate change, particularly in areas that become increasingly water- stressed (Kumar and Parikh, 2001).

The agricultural sector in India is influenced by more than changing climatic conditions. Widespread promotion of Green Revolution technologies during the 1960s increased agricultural yields in India for some crops and farmers by introducing high yielding varieties that depend on inputs, including irrigation, chemical fertilizers and pesticides. In recent years national and state agricultural policies have emphasized decentralized and participatory natural resources management, particularly for practices such as watershed development and agro forestry (Sanyal, 1993). At the same time rapid liberalization in the Indian economy has had significant structural effects on Indian agriculture. Since 1991, economic reforms have included reductions and changes in import and export

restrictions and tariffs, changes in access to agricultural credit and reductions of production subsidies. Although liberalization of agricultural trade has been limited relative to other sectors of the Indian economy, India's potential participation in the WTO Agreement on Agriculture suggests that greater changes are forthcoming (Rajan and Sen, 2002). The effects of these economic changes are expected to be uneven, with some regions and farmers benefitting from market liberalization and from new inflows of investments and technology, while others may have difficulty adjusting to a more open economy, particularly to the effects of increasing competition from agricultural imports (Gulati and Kelly, 1999).

CONCLUSION-

The climate change as realized through trends of temperature increase and rise in the concentration of carbon dioxide is a major concern. Multiple environmental changes will have consequences for global vegetation. To the extent that crop yields and ecosystems are affected, there can be important economic consequences. We are now experiencing the adverse effects of climate change. Shift in the rainfall pattern, increased amount of carbon dioxide and other GHG gases, biological health of soil, pests, diseases and weeds, glacier retreat, submergence of islands and coastal areas and erratic behaviour of migratory birds directly pose a definite threat for our forthcoming future generations and earth. We must make an all out effort to mitigate the possible effects of climate change. Intensive agriculture in our country has already started showing signs of yield stagnation in some parts of north- west India, raising the alarm of sustaining the yields by adoption of suitable and most appropriate agronomic management options. This concern has now be viewed along with the climate change and its variability. Crop simulation techniques offer an opportunity to link the climate change with the other socio-economic and bio-physical aspects. These models can effectively work out the impact an also suggest suitable mitigation options and techniques to sustain the agricultural productivity. There might be some hindrances and obstacles in the adoption of the efficient adaptation techniques. Because almost all the developing and underdeveloped countries suffer some social and technical constraints that may not necessarily result in sustainable production over long time frames. But a concerted adaptive strategy which is politically appropriate, socially viable, culturally acceptable and environmentally sustainable is need of hour for the welfare of the humanity and the planet earth.

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POST-AMNESTY PLAN, PEACE-BUILDING AND PEOPE-CENTRED DEVELOPMENT IN THE NIGER DELTA: A POLYCENTRIC PLANNING AND POVERTY REDUCTION STRATEGY (PPPRS)

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SYNOPSIS

This proposal charts a course of action that the Federal Government of Nigeria can take in order to consolidate the gains of amnesty programme by building peace and engineering people-centred development in the Niger Delta. From theoretical formulations to empirical analysis, this proposal uses the Institutional Analysis and Development (IAD) framework to diagnose the missing links in several efforts and programmes designed to addressing the crisis in the Niger Delta. While the present amnesty programme has yielded some good results, the grey area – post-amnesty plan – that can address the problems and challenges that triggered violence, insecurity and economic loss in the Niger Delta requires urgent attentions. In other words, amnesty programme needs be complemented with pragmatic post-amnesty poverty reduction and development strategies that are people-oriented. It is apposite to make hay while the sun shines. In the light of this exigency, this proposal considers it imperative to adopt a polycentric planning and poverty reduction strategy (PPPRS) to resolving the Niger Delta crisis.

The proposal is a summary of innovative problem-solving and solution-seeking ideas that area capable of addressing several challenges that are confronting the Niger Delta. It contains a well designed post-amnesty plan and programmes that can ensure economic empowerment, poverty reduction, people-centred development and peace-building in the region. The proposal designs a Niger-Delta Post-Amnesty Development Model (NDPADM) that derives inspirations and workability mechanisms from fifteen (15) African development models that are problem-solving and solution-seeking in several sectors of the economy in the Niger Delta. At the heart of NDPADM is African Public Sphere Restructuring Model (APSRM) designed for the setting up self-governing community assembly (SGCA) for deliberation, collegiality, mutual trust, reciprocity and shared community of understanding to enable citizens, both elite and non-elite to operate in synergy to collectively achieve socio-economic and techno-political objectives. Without a restructuring of the public space that could enable all the diverse interests in the Niger Delta to operate as colleagues with equal standing such that oil benefits are shared equitably, amnesty programme will be tantamount to fire brigade exercise, a waste of resources and a cycle of reinforced violence.

Under the proposed new institutional arrangement, amnested persons will be involved in the activities of community assembly where they can function as agents of change in development arenas. Invariably, the amnesty programme of the federal government would enable ex-militants, freedom fighters, revolutionists and other citizens to make meaningful contributions towards development. The outcome of the restructuring is emergence of new institutional arrangements, which would reflect integrative constitutional order in socio-economic and techno-political realms. It is this joint action and synergy by the major stakeholders (public officials, scholars, oil companies and representatives of community self-governing institutions) that would eventually determine how government policies in all spheres of life in the region are to be implemented. After the institutional arrangement has been designed, operational strategy for implementation of any programme/project (e.g. employment generation, food security, road development, poverty reduction, environmental management, security of life and property, electoral reform and democratisation, conflict detection, prevention and resolution, etc.) can then be fashioned out. It is at this stage that any of the fifteen models can be applied to any of the specific action situations. For example, the Nigerian government can kick start post-amnesty programmes by implementing food security and employment generation programmes in the Niger Delta.

INTRODUCTION

This proposal charts a course of action that the Federal Government of Nigeria can take in order to consolidate the gains of amnesty programme by building peace and engineering people-centred development in the Niger Delta. As the seventh largest producer of oil and gas in the world and the largest in Africa, the Niger Delta contributes over 40% to the Nigeria's GDP, about 90% of total annual earnings and about 80% of the national gross income (Federal Government of Nigeria [FGN] 2008:212). Despite the population of the region (about 33.5 million) accounting for about 23.0% of the national population (FGN 2008:189), the Niger Delta is characterized by accumulated problems - poverty, neglect, environmental degradation, and transport bottlenecks (Naanen 1995; Obi 2004:450; Akinola 2008b:89). In spite of its strategic economic importance, the demographic picture of the region as shown by the Human Development Index[1] (HDI) is deplorable. The HDI of the region is as low as 0.564, compared with other regions and nations with the same oil and gas resources such as Saudi Arabia (0.800), United Arab Emirate (0.846), Kuwait (0.844), Libya (0.799), etc. (Human Development Index Report 2005:6 cited in Okaba 2008:30).

These problems are consequential upon the public sphere being dominated by the few elite with "particularistic" concerns at the exclusion of the people. The affluence exhibited by many workers of the oil companies and political office holders in Nigeria sharply contrasts with the social deprivation of most residents of oil communities whose livelihoods are threatened (Akinola 1992, 1998, 2000, 2003a, 2005d, 2008b:89; Obi 2004:448). In response, the people of oil communities resisted this oppression of the federal government and oil companies in various ways (Douglas and Ola 1999:334; Obi 2000a:281). Consequently, four major groups, as identified by Akinola (2008b:90), with diverse interests have emerged strategizing for different reasons. Consequently, the challenges in the region have become complex and complicated.

The problems are largely a case of institutional dilemma which confirms the problem of "disconnect" that is caused by the absence of appropriate institutional mechanisms that could motivate the people (elite and non-elite) to work together as partners in development in the region. The stakeholders in development – governments, oil companies, other agencies and the Niger Delta people – operate on parallel lines, instead of as colleagues with equal standing within governance and development arenas. Without the citizens playing active role in decision making, governance process would continue to exclude and marginalize them. This factor has also accounted for the Niger Delta Master Plan and dialogue to resolve the problems in the region.

Using the Institutional Analysis and Development (IAD) framework developed over the years by Vincent Ostrom and Elinor Ostrom and colleagues at the Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, USA, this proposal discusses repetitive missing links between and among the stakeholders in the governance of public affairs in the Niger Delta and also proffers possible solution to the challenges in the region. The IAD believes in institutional arrangement designed by people who cooperate based on rules and constitution of their choice, and thereby able to resolve socio-economic and political problems which other people (external to their conditions) are not capable of doing for them.

Akinola (2008b) found that the inability of the elites leadership, governments and oil companies in the Niger Delta to respond appropriately to the needs and aspirations of the citizenry provoked opportunity for the people to carry out social responsibility that the state has effectively dodged over the years. The local people through self-governing institutions in the region have been able to respond to social challenges by exploring pre-colonial governance heritage and to certain extents have been able to address their daily needs (Akinola 2008b). The contention of this paper is that these people-centred creativities and adaptation strategies should form the basis

[1] Human Development Index is a standard measure of well being of people, encompassing the longevity of age, knowledge and decent standard of living in terms of access to safe and clean water, quality health and education services, electricity, road, gainful employment, political participation, rule of law, etc. It is measured with 1 being the highest ranking score.

for reconstructing governance and development in the Niger Delta. It is in this regard that polycentric planning and decision making arrangements that regard community self-governing institution as a major player in crisis resolution and development become imperative. Polycentric planning is a deliberate act of setting up multilayered and multicentred institutional mechanism that regards self-governing capabilities of local communities as foundation for reconstituting order from the bottom up. It can also be described as the process of ordering the use of physical, human and institutional resources as well as engaging the citizens in contractual relations with the public authority.

The point of departure of this paper is in problem solving and solution seeking. The paper is, therefore, concerned with how to reconfigure the public space through appropriate institutional mechanism that could bring the Niger Delta people into the main stream of socio-economic and political decisions, thereby synergizing the efforts of the state, oil companies and community institutions through bottom-up and integrative planning. It also suggests adaptive planning strategy, using multi-layers and multi-centres institutional arrangements, to connect the stakeholders in a polycentric manner in order to resolve the hydra-headed challenges in the region. In the light of this exigency, this paper develops a Niger-Delta Post-Amnesty Development Model (NDPADM) that derives inspirations and workability mechanisms from fifteen (15) African development models that are problem-solving and solution-seeking in several sectors of the economy in the Niger Delta.

This proposal is, therefore, concerned with community institutions as the platform and basal point of decision making on the rational utilization and sustainability of environmental resources (natural and artificial) in meeting the yearning and aspirations of Niger Delta citizens. This is where amnested persons can function as agents of change in development arenas. Invariably, the amnesty programme of the federal government will enable ex-militants, freedom fighters, revolutionists and other citizens in the region to make meaningful contributions towards development. This, undoubtedly, will bring lasting peace and development to the Niger Delta.

CONCLUSION

This paper concludes that the good steps of the Federal Government of Nigeria that commenced with amnesty programme can only yield lasting dividends in terms of peace and people-centred development if Polycentric Planning and Poverty Reduction Strategy (PPPRS) is employed in the Niger Delta. In the light of this exigency, this proposal designs post-amnesty plan and programmes that can ensure economic empowerment, poverty reduction, people-centred development and peace-building in the region. The proposal develops a Niger-Delta Post-Amnesty Development Model (NDPADM) that derives inspirations and workability mechanisms from fifteen (15) African development models that are problem-solving and solution-seeking in several sectors of the economy in the Niger Delta. At the heart of NDPADM is African Public Sphere Restructuring Model (APSRM) designed for the setting up self-governing community assembly (SGCA) for deliberation, collegiality, mutual trust, reciprocity and shared community of understanding to enable citizens, both elite and non-elite to operate in synergy to collectively achieve socio-economic and techno-political objectives. Without a restructuring of the public space that can enable all the diverse interests in the Niger Delta to operate as colleagues with equal standing such that oil benefits are shared equitably, amnesty programme will be tantamount to fire brigade exercise, a waste of resources and a cycle of reinforced violence.

Under the proposed new institutional arrangement, amnested persons will be involved in the activities of community assembly where they can function as agents of change in development arenas. Invariably, the amnesty programme of the federal government would enable ex-militants, freedom fighters, revolutionists and other citizens to make meaningful contributions towards development. The outcome of the restructuring is emergence of new institutional arrangements, which would reflect integrative constitutional order in socio-economic and techno-political realms. It is this joint action and synergy by the major stakeholders (public officials, scholars, oil companies and representatives of community self-governing institutions) that would eventually determine how government policies in all spheres of life in the region are to be implemented. After the institutional arrangement has been designed, operational strategy for implementation of any programme/project (e.g. employment generation, food security, road development, poverty reduction, environmental management, security of life and property, electoral reform and democratisation, conflict detection, prevention and resolution, etc.) can then be fashioned out. It is at this stage that any of the fifteen models can be applied to any of the specific action situations – food security, employment generation, economic empowerment, poverty reduction, etc.

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APPLICATION OF GIS TECHNIQUES IN URBAN SOLID WASTE MANAGEMENT IN A PART OF DHAKA CITY: MOHAMMADPUR THANA

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ABSTRACT

For developing countries like Bangladesh, urban solid waste management (USWM) is a complex issue and an integrated concept as well. Geographic Information System (GIS) was applied in this study to propose better solid waste management in a part of Dhaka city. Mohammadpur Thana comprised of 11.65 km^2 is a residential area and about 64% of its generated solid wastes were managed by Dhaka City Corporation (DCC). The Composite Index on Impacts on Health showed increasing value 1.55 to 1.73 from the year 2002 to 2007 indicating progressive deterioration of health and environmental quality of the study area. This study described two options for better solid waste management practice of Mohammadpur Thana, one was with relocating existing bins and containers and another with a scenario attaining 80% waste collection efficiency including selection and optimization of waste collecting routes with proposed numbers of bins (25), containers (30) and existing illegal dumping sites (14). A participatory management option, Community Management Information System (COMMIS) incorporating Management Information System (MIS), modification of communal bin, establishment of Mini Transfer Station (MTS) at specific sites, 3R (Reduce-Reuse-Recycle) and incorporating Clean Development Mechanism (CDM) in preparing Solid Waste Model were recommended for efficient urban solid waste management.

INTRODUCTION

Urban Solid Waste Management (USWM) is now a complex issue in Bangladesh due to its increasing population and industrial growth. Solid waste (SW) generation is increasing proportionately with the growing urban population. At present, 522 urban centers including 254 municipalities in 6 cities are present in Bangladesh (SAARC, 2004). So, solid waste management (SWM) is an obligatory function of urban local bodies in Bangladesh. Solid waste is non-liquid waste materials arising from domestic, trade, commercial, agricultural, industrial activities and from public services (Palnitkar, 2002). Urban solid wastes (USW) include commercial and residential wastes generated in municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes but including treated bio-medical wastes and the types of solid waste depend on the commodity usage and lifestyle of the people. The estimates for solid waste production for Dhaka city was varied from 3,500 to 4,500 metric tons per day on very rough per capita basis, which has been taken to be between 0.45 and 0.50 kg. Taking the mid-figure of 4000 tons per day at present, and with a 5 percent growth rate of population, the city is apprehended to have a proportionate increase in solid waste generation. By 2015, more than 6,000 tons of Solid Waste will be generated in Dhaka City Corporation (DCC) area (DCC, 2004).

The management issue of generated solid waste is not only multifaceted with its increasing quantities but also with its inadequate management system (Tinmaz & Demir, 2005). In this study, Geographic Information System (GIS), a good decision support tool for waste management planning were used to define the possible option for efficient solid waste management. According to Ogra (2003), the more the layers in terms of information, the more will be better decision analysis. Urban solid waste management practices require collection of decisive information which is for taking corrective measures as well as for proper planning to ensure sustainability (Ramachandra & Saira, 2003).

This study was conducted at the part of Dhaka city, Mohammadpur Thana (11.65 km^2), located at 23°44′32″N-90°20′E to 23°45′40″N-90°23′E geographic boundary of Dhaka district. The study area consisted of six wards, 41, 42, 44, 45, 46 and 47 (part), out of 90 wards in Dhaka City with 198,306 household units. The main objectives of this study were to explore the current Solid Waste Management (SWM) practice including waste generation, location of waste bins, type, size and frequency of waste removal from the bins and to propose requirements and relocating of bins using GIS considering the current practice for better waste management.

CONCLUSION AND RECOMMENDATIONS

Urban solid waste management requires efficient waste collection and dumping system and about 64% of generated wastes had been collected by DCC with the existing bins and containers. The Composite Index on Impacts on Health used as an indicator for health and environmental quality showed increasing value [1.55 to 1.73] from the year 2002 to 2007 indicating progressive deterioration of health and environmental quality. The proposed bins and containers relocation were suggested considering the existing number of bins and containers using contemporary GIS technique with its associated tools to achieve 80% waste collection efficiency. It was found at about 55% of the recyclable wastes were collected by local ragpickers. About 25 waste bins and 30 waste containers would be sufficient to achieve the 80% collection efficiency with reducing existing illegal disposal sites.

For sustainable urban solid waste management, strategic SWM planning should be incorporated in an integrated approach by the waste management authorities (DCC). Communal bins should be re-designed according to the requirements of the community which will help to minimize illegal waste dumping as well saves collection time and disposal cost. Management Information System (MIS) should be incorporated in Solid Waste Model (SWM) for proper waste storage and apposite route selection for the waste collecting vehicles (i.e., trucks). Mini transfer Station should be constructed at each waste container location. As only the single MTS was seen in Lalmatia (Ward 45), such type of construction will reduce the odor and traffic problem but require space. Segregation of wastes at primary and secondary level at waste collection should be conducted. A COMMIS (Community Management Information System) incorporating people's participation should be built considering waste generation, collection and transportation (schedule, numbers of truck, etc). COMMIS will ensure better SWM with integration of people's participation and contemporary technologies. GIS technique is an efficient tools for constructing COMMIS, such technologies will be helpful for not only minimizing wastes but also to utilize the wastes in different ways. Clean development mechanism (CDM) should be incorporated in SWM model and 3R (Reduce-Reuse-Recycle) campaign should be supported at all levels for waste minimization and its proper utilization.

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THE ROLE OF WOMEN IN NATURAL RESOURCES MANAGEMENT

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INTRODUCTION.

In developing countries, economic problems are frequently both a symptom and a cause of environmental degradation. Sustainable economic development (growth with equity and justice), social development, resources conservation and environmental protection are independent but mutually interlinked and reinforcing components of sustainable development (UNEP, 19991). However, the natural resources and environment give the essential basis and elements for economic activities and livelihood options of the population of a society, who are often stratified in social and wealth categories and compete for resources, wealth, wellbeing and power.

The problematic of rational use of natural resources and conservation of the environment are a matter of special importance in the present stage of humankind's development (Bruce, 1997). Thus, when an economic depression hits, the population is forced to intensity the use of its resources (Diduck, 1999). Economic necessity leads to overgrazing and deforestation, thus reducing the productivity of land and soil, increasing the frequency of floods and droughts, causing greater poverty and despair, particularly in underdeveloped sectors of a country.

In addition, our civilizations are at risk because we are misusing natural resources and disturbing natural systems. We are pressing the earth to the limits of its capacity. (John, 1998). We are pressing the earth to the limits of its capacity. Since the industrial revolution, human numbers have grown eight fold. Industrial production has risen more than hundred times in the past hundred years. This imprecedented increase in human numbers and activity has had major impacts on the environment. Hence, the capacity of the earth to support human and other life has been significantly diminished. Humanity must take no more from nature than natural can replenish. (IUCN and UNEP, 1991).

Besides, there is some evidence that, in most cases and under economic and social stability conditions, residents may turn into a dynamic agent participating in the process, carrying out a series of strategies for the protection of their resources. As the country's economic conditions degrade, producers and strategies, perhaps speeding up the process of environmental degradation. Decades of research and project have shown that addressing gender and social – economic concerns are means to promoting sustainable agricultural development and natural resources management (CIDA, 1995).Recently, (FAO, 2003) assessed the status of gender sensitive indicators in the management of natural resources in Nepal and Egypt; the assessment revealed a lack of practical experience in this area and a low level of gender sensitive monitoring of natural resource management projects in general.

Thence, the sustainable utilization of natural resources has a gender dimension. Men and women by tradition often use natural resources differently and have different roles in society. While women, through their daily work, generally possess significant knowledge with regard to natural resources, they tend to have weak and insecure rights to these resources (WCED, 1998) .Women, the world's main food producers and fuel and water collectors, are especially affected by environmental deterioration and lack of rights to land tenure and control over resources. It is from this point, the paper examine on the positive and negative impact that women make towards the management of natural resources.

CONCLUSION

Women are more linked with natural resource use and conservation than men. Their traditional gender roles bring them in daily contact with natural resources such as land, water, forest and wildlife. They have to use these resources because their livelihood most depends on these resources. When these resources are exploited and ruined women suffer most. If they are wisely used sustainable women benefit most. Most women want to learn and to be recognized for what they really are: managers of natural resources.

The choice to involve women is a choice for sustainability; it's a choice that will empower rather than increase conflicts over limited highly needed natural resources. It is even a choice that will lead to conservation of natural resources being lost to consumptive and exploitative land use alternatives. The

basis is to allow traditional use and benefit, yet elicit responsibility with such rights and privileges so that at the end, benefits are close linked with conservation responsibilities.

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THE IMPACT OF HUMAN ACTIVITIES ON COASTAL ZONE FOR SUSTAINABLE LIVELIHOOD.

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Coastal and marine resources throughout the
world have suffered major impacts by human actions since early colonial days. Several reports over the period 1990 -2003 have highlighted the growing nature and extent of the impact of human activities on water basins, marine and coastal environments. (Liden, 1993).
The coastal zone, between the seaward margins of continental shelves (to a depth of about 200metres) and the inland limits of the coastal plains (to a comparable elevation above sea level) has the highest biological productivity on earth. It is also home to most of the world's population, who depend on its resources and largely determine its state of ecological health (IUCN, 1991). Six out of ten people live within 60km2 of coastal waters, and two-thirds of the world's cities with population of 2.5 million or more are near tidal estuaries. Thence, within the next 20 -30years the population of the coastal zone is projected to almost double. These pressures linked to ever – increasing resource consumption and the impacts of expected climate change and sea level rise which have major effects on the coastal zone. (Matthew, 1991).
However, people have long clustered their settlements near coastlines, and our species has a long history of interacting with the oceans. But it has been exploited and polluted with waste. Thus, humans have taken from the oceans and also given back – in the form of pollution and its degradation. As a result of human activities both inland and in the coastal zone itself, coastal and marine ecosystems and resources are rapidly deteriorating in many parts of the world because the vast resources of the oceans are, an essential element for the survival of coastal communities. Hence, this paper aims to examine human activities on coastal zone and the strength of sustainability to reduce the degradation of coastal zone.

CONCLUSION.

The ability to translate coastal resources into optimum national and local benefits is being constantly threatened by environmental degradation, resource use conflicts and unsustainable resource use. Despite the fact that coastal resources are for survival, the stakes are high, the issues complex and challenging but we must restore and continue to protect our coastal ecosystems.

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APPLICATION OF ICT TO RESOURCE AND DISASTER MANAGEMENT

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Abstract
Expansion works such as road expansion and location of new facilities had attracted huge compensations for demolished houses, farmlands and facilities, thus making the cost of future developments in the built environment very prohibitive. A number of urban cities in Nigeria are proposing Mega City Projects which call for sustainable physical planning and property management in other to minimize cost.
This paper proposes the application of information and communication technology (ICT), particularly the use of modeling and visual reality to sustainable physical planning and property management with a view to carrying out future expansion works with reduced compensation cost. Also, the paper considers the development of a Mobile Ad Hoc Network (MANET) for disaster response and management within the built environment.

Keywords: ICT, MANET, GIS, Modeling, Visual Reality, Facility Management, Disaster Management, Facility Location, and Built Environment.

1. Introduction

The concept of sustainable development has been largely missing in our design culture. Building structures are usually at the discretion of the land owners and individuals who buy can erect whatever structure of choice. Experience has shown that in Nigeria, the planned areas in the country are largely the Government Reservation Areas (GRAs).
However, taking a cue from the developed economics, Europe, United Kingdom, South Africa etc. the whole streets and structures are well-planned and governments through the mortgage firms are central to the acquisition of homes.
There is need to be futuristic in the planning, design and construction of buildings. Ogunlana (2006) presented sustainable buildings as a major consideration in building construction in the 21st century through the cycle of planning, design and construction. The National Institute of Building Science (NIBS) opined that sustainable designs would lead to avoidance of resource wastage, depletion of energy, water and raw materials, prevention of environmental degradation caused by facilities and infrastructure throughout their life cycle and create a built environment that is safe, conducive, comfortable and productive (NIBS, 2005).
Generally, the built environment professionals through the use of advanced technologies such as the geographic information system (GIS), Visual Reality (VR) and Global Positioning System (GPS) can optimize site potential, energy use, protect and conserve water, optimize operational and maintenance practices (NIBS, 2005).
Environmental development in the area of expansion works such as road widening and location of new or re-location of existing facilities were identified to have been attracting enormous compensations for demolitions and alterations making the cost of development exorbitant. As a number of urban cities in Nigeria are proposing mega city projects, there is the need for sustainable physical planning and property management in order to minimize cost in this area of physical and human development.
All these developments could be shaped by the role played by disaster risk as observed by Human Development Report (HDR) of the United Nations Development Project (UNDP,1999). It has also been observed that disaster risk has been a concern of regional works not only in Nigeria but all over the world as expressed (UNDP, 1999 & UNDP, 2002). The main reason for reducing disaster risk, which is a challenge to development, is to identify the relationship between human development and disaster because the objective of development itself is to create an enabling environment for people to enjoy long, healthy and creative lives.
The rest of the paper is arranged as follows: section 2 presents the objectives of the paper, section 3 presents related works, section 4 presents ICT and disaster management, section 5 presents the

development issues on the evolving Mega City syndrome as well as the dredging of River Niger, section 6 presents the recommendations while the conclusion is presented in section 7.

Recommendations

The following are some recommended actions for future expansion works:

- Reservation can be made to reduce the amount of compensations to land/building owners.
- Government should institute development plans (Vision 2025) to start now.
- Provisions should be made for energy, water, roads and various layouts presented.
- The Public, Private, Partnership (PPP) initiative is suggested for optimum result.
- A review of the academic curriculum to match our envisioned world.
- Retraining of the current built environment professionals to deliver on expectations.
- An increased use of ICT tools within the built environment professional.
- Development of an effective communications system to help in disaster management

8. Conclusion

We conclude that the use of advanced technologies such as the geographic information system (GIS), Visual Reality (VR) and Global Positioning System (GPS) can optimize resource management. Most of the environmental hazards may not be preventable: earthquake, hurricane, flood, acid rain, volcanic ash etc but appropriate technologies can be employed to make accurate forecast and predictions to reduce the amount of causalities.

This paper presents the use of MANET to provide a quick, self-configurable and inexpensive communication infrastructure for email, text communication and instant messaging in other to enable all the parties involved to interact continuously.

Future developments and expansions require concerted efforts from government, professionals and the academia. Appropriate recommendations were made, which include: increased use of ICT tools, involvement of the Public, Private Partnership initiatives, making reservations for future developments in our plans and designs and to make effective use of the ubiquitous mobile devices for disaster management among others.

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VERMITECH AN INNOVATION IN ORGANIC SOLID WASTE MANAGEMENT

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ABSTRACT
In recent years, the disposal of organic wastes from domestic, agricultural and industrial sources has caused increasing environmental concerns. In this regard, the recycling of utilizable waste is feasible. This can be solved by combination of effective technologies like Biodung composting and Vermitech (incorporating earthworms for the production of vermicompost). The present work was carried out during the year 2006-2007 at University of Guyana, Georgetown to recycle grass clippings, water hyacinth and cattle dung by using *Eisenia fetida* the locally available surface species of earthworm. The results indicated that the organic waste (grass clipping s and water hyacinth) were successfully processed through partial biodung composting and vermicomposting during the period of 60 days. The temperature study during biodung composting showed two peak rise of temperature resulting in destruction of harmful microbes. Subsequent vermicomposting resulted in production of vermicompost confirming to the excellent nutrient status recorded in earlier experiments. The temperature study during vermicomposting showed that fluctuation was restricted to $\pm$0.83.
Organic amendments like vermicompost increase the organic matter content necessary for the maintenance of soil properties, which is beneficial for long-term sustainability and crop productivity. Considering the above it is proposed that large-scale production of vermicompost through vermitech to recycle organic waste could effectively help in managing solid waste, and farmers for crop productivity could apply vermicompost thus produced. This could lead to a suitable environment-friendly effort towards a balanced ecosystem.

Keywords: Organic waste, biodung composting, vermitech, vermicompost, earthworms.

INTRODUCTION

In recent years, disposal of organic wastes from various sources like domestic, agriculture and industrial has caused serious environmental hazards and economic problems. In this regard, recycling of organic waste is feasible to produce useful organic manure for agricultural application. The role of earthworms in organic solid waste management has been well established since first highlighted by Darwin (1881) and the technology has been improvised to process the waste to produce an efficient bio-product vermicompost (Kale *et al.,* 1982; Ismail, 1993, Ismail, 2005). Epigeic earthworms like *Perionyx excavatus*, *Eisenia fetida, Lumbricus rubellus* and *Eudrilus eugeniae* are used for vermicomposting but the local species like *Perionyx excavatus* has proved efficient composting earthworms in tropical or sub-tropical conditions (Ismail, 1993; Kale, 1998). The method of vermicomposting involving a combination of local epigeic and anecic species of earthworms (*Perionyx excavatus* and *Lampito mauritii*) is called Vermitech (Ismail, 1993; Ismail, 2005). Compost is becoming an important aspect in the quest to increase productivity of food in an environmentally friendly way. Vermicomposting offers a solution to tonnes of organic agro-wastes that are being burned by farmers and to recycle and reuse these refuse to promote our agricultural development in more efficient, economical and environmentally friendly manner. Both the sugar and rice industries burn their wastes thereby, contributing tremendously to environmental pollution thus, leading to polluted air, water and land. This process also releases large amounts of carbon dioxide in the atmosphere, a main contributor to global warming together with dust particles. Burning also destroys the soil organic matter content, kills the microbial population and affects the physical properties of the soil (Livan and Thompson, 1997).

Guyana is a country of few million people of various origin including Indians and is dominted by agriculture practices for the cultivation of sugarcane and rice.Being A developing country it also face basic problem of organic waste management. Therefore recycling of organic solid waste from the campus at university of

Guyana was carried out during the year 2006-07. Vermicomposting is the biological degradation and stabilization of organic waste by earthworms and microorganisms to form vermicompost (Edwards and Neuhauser, 1988). This is an essential part in organic farming today. It has been recognized that the work of earthworms is of tremendous agricultural importance. Earthworms along with other animals have played an important role in regulating soil processes, maintaining soil fertility and in bringing about nutrient cycling (Ismail, 1997; Lalitha *et al.,*). The objective of the study carried out was to develop combination of effective and low cost technologies to recycle organic waste like grass clippings and water hyacinth and produce biofertilizer vermicompost with rich nutrient status which could play a role in agricultural enrichment of a developing country like Guyana (Ansari and Ismail, 2001a;2001b

CONCLUSION

The investigations carried out at University of Guyana showed that the combination of effective technologies like Biodung composting and vermicomposting results in reduction of time period of recycling with minimum resources at an affordable cost with locally available resources. The nutrient status of the product vermicompost obtained confirmed to the standards recorded in the earlier experiments. Such technologies in organic waste management would lead to zero waste techno farms without the organic waste being wasted and burned rather then would result in recycling and reutilization of precious organic waste bringing about bioconservation and biovitalization of natural resources.

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ASSESSMENT OF BIOSTIMULATION USING SOME ORGANIC WASTES IN BACTERIAL RECLAMATION OF CRUDE OIL CONTAMINATED AGRICULTURAL SOIL

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ABSTRACT

Crude oil contamination of agricultural lands is a major problem in oil producing nations. Even the non oil producing nations that depend on supply through cross country underground and on high sea transportation are not spared due to accidental spillages. Apart from loss of farms, oil spills have led to shortened fallow periods, land use deterioration and led to a loss of soil fertility. The Effect of cow dung, sewage sludge and poultry droppings was tested in reclamation experiment. Nine of the twelve plots selected for this work were deliberately contaminated with Bonny light crude oil. The other three were uncontaminated (control). The Plots were left for seven days after which they were amended with the three organic wastes tested. The seeds of *Amaranthus* spp. were scattered in all the treatment plots and the control. Post planting irrigation was ensured for 10 weeks. Also cultures of the bacterial isolates were inoculated in all the plots. Seedling growth was monitored. Different parameters such as stem length, leaf length, leaf number and plant population were measured and counted respectively. Sewage sludge had shown better results than others, however, all the organic wastes showed appreciable effect in crude oil decontamination as indicated by growth and development of *Amaranthus* spp.

INTRODUCTION

Land contaminated by oil may be rendered unsuitable for plant growth by increasing the toxic contents in the soil (Nwankwo and Ifeadi, 1988). Crude oil shows a coagulatory effect on soil, it binds the soil particles and hence reduces aeration. Therefore, seed sown on such soils will fail to germinate (Ogboghodo *et al*., 2004). Heavily contaminated soils may remain un-usable for months or years until the oil has been degraded to tolerable levels (Eboe, 1986). Other adverse effects oil has on plant growth may range from root stress, morphological aberration and reduction in biomass.

Crude oil contamination of agricultural soils has dramatically affect food production particularly in oil producing areas. Also the use of cross country underground pipelines to convey crude oil and/or refined hydrocarbon products to different parts of Nigeria has led to more frequent instances of farmland contamination through pipe rupture and spillage. Oil contamination in soils result in imbalance in the carbon to nitrogen ratios. This

causes a nitrogen deficiency which not only retards the growth of agriculturally relevant microorganisms but even plants grown on such soils (Chikere and Chijioke 2006).

Crude oil contamination affects biodiversity which is critical to agricultural productions. For example, extensive destruction of insects due to oil pollution can affect pollination and hence fruit formation in seed plants. Also the birds which may suffer reproductive problems through reduced egg productions are important in dispersal of fruits. This may limit distribution of plant species leading to extinction. Sea birds are particularly affected by spills as the oil penetrates and open up the structure of their plumage thereby, reducing the insulating ability of their feathers. This makes them more vulnerable to temperature fluctuations. The smothered feathers also impair flight abilities. The oil may also cause kidney damage, altered liver function and digestive tract irritation in birds.

Nigeria has the third largest mangrove forest in the world and the largest in Africa (9.730Km^2) occupying the lower stretches of the southern limit of the Niger Delta and covering between 5,400Km^2 and 6000Km^2 (Niger Delta Environmental Survey, 2000). There are three main mangrove families (Rhizophoraceae, Avicenniaceae, and Combretaceae) comprising six species namely *Rhizophora racemosa, Rhizophora, mangle, R. harrisonii, Languncularia racemose, Avizeania germinans and Conocarpus erectus*) spreading in the Niger Delta, Nigeria (Research Planning Institute, 1985; NDES, 1996, 2000,; Niger Delta Development Commission, 2004) Another important component of the mangrove vegetation is the exotic Nypa palm (*Nypa fruticans*) of the family palmae introduced from Singapore Botanical gardens to Calabar and Oron.

The Mangrove plants (*Rhizophora* spp.) are salt tolerant species that grow on sheltered shores in the tropics and subtropical estuaries (International Petroleum Industry Environmental Conservation Association, 1993). They provide ecosystem functions and human utility benefits especially for coastal communities of Niger Delta, Nigeria. Their halophytic nature and ability to compensate for low oxygen in the soil allows them to flourish in the environment. However, their complex breathing roots make them vulnerable to crude oil which can block the openings of the breathing roots. This has posed serious threats to mangrove plants. The interaction between crude oil and breathing roots and pores leads to asphyxiating of the subsurface of the roots that depends on the pores for oxygen transfer (Odu *et al.,* 1985). This in turn impairs the normal salt exclusion process resulting in accumulation of excess salt in the plant contributing to enhancing the stress condition of the plant and ultimately, to death. On account of this, mangrove plants are vulnerable and undergo steady unpalatable decline in quality and functions in the integrity of the ecosystem. This is why in this research the effect of Bonny light crude oil on growth and development of *Amaranthus* seedlings using growth attributes (such as shoot length, leaf length, number of leaves, *vis a vis* Soil reclamation efforts using organic wastes was assessed. Apart from using anatomy in the systematic of plants, some other workers have also used anatomy of plant to monitor environmental pollution (Omosun *et al.*, 2008). Sharma *et al.,* (1980) have reported morphological and stomatal abnormalities as an effect of environmental pollution on plants. Also Gill *et al.*, (1992) reported that stomata in *Chromolaena odorata* were grossly affected by crude oil which manifest as distortion and reduction in the number of stomata per unit area of the leaf. Several workers have also reported the effects of crude oil on the growth and physiology of different plants (Terge, 1984, Gill *et al.,* 1992; Pezeshki and Delaune, 1992; Quinones – Aquilar *et al.,* 2003 ;)

) **DISCUSSION**

The crude oil degrading bacteria shown in Table 1, fall within those reported by Kajasheikh *et al.*, (2002) and Okoh (2006). It can be seen from their biochemical reactions that they lack the necessary enzymes to metabolize carbohydrates. This probably could be the reason why they use hydrocarbon as an alternative carbon source. The results of crop yield parameters (stem height, leaf size, leaf number and plant population indicated in Tables 2-5 shows that sewage sludge is better than chicken droppings and cow dung. It can thus, be seen as a good resource in agricultural soil conditioning practice particularly, in pollution prone areas. The trend observed here may be attributable to enhancement of porosity of the soil thereby, making movement of nutrients and gases much easier. Thus, popularizing the use of treated sewage sludge in vegetable farming is an endeavour that has a potential in boosting agricultural productions while achieving sustainable environmental sanitation.

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CULTURAL SUSTAINABILITY: CONTRASTING HOUSING TRANSFORMATION PATTERNS OF PERI-URBAN ABUJA AND CORE DHAKA SETTLEMENTS

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Abstract
Informal settlements constitute the bulk of urban housing stock. Culture specific dwelling units in the developing countries are transforming fast to commercial style housing due to drastic urbanization, globalization and their attendant acculturation. This paper focuses establishing commonalities and disparities of the situations in Abuja, Nigeria, and Dhaka, Bangladesh, in terms of the transformation process, the predicating denominator, and the driving force. It will make comparative analysis of the changing residential patterns in these two developing world cities in Africa and Asia over a period of several decades. This research qualitatively contrast physical, social and psychological adjustments observed in traditional family compounds typical of Abuja; and the commercial subdivision of old Dhaka houses. In line with the post positivists' epistemology, an emergent-grounded theory triangulates with quantitative evidence and field observation. The findings suggest a fusion of isolated Gbagyi housing units into hollowed-out structure physically; and fission of the tribal group socially. Individualism replaces communal responsibility, with Islam and Christianity as moderators in Abuja, while the core Dhaka housing transformation pattern emphasizes on spatial economization through subdivision, addition-subtraction, conversion and reconstruction, motivated by convenient fraternity of respective socio-economic classes that are united in housing themselves. These findings give evidence of economic precedence over cultural sustainability in the process of housing transformation. However, the capitalist tendency of the twenty first century for income first, jeopardizes local identity, rhythm and modernity. This could have a global implication on cultural sustainability of vernacular housing in the urban environment.

Key words: *Informal settlements, cultural sustainability, housing transformation, informal delivery*

Introduction

Continuous process of spatial adjustment manifests in individual household's efforts to respond to their changing needs is the essence of evolution of a living city. Housing adjusters' world view, especially religion, moderates their choices of spatial order (Mai, 2008). The political, social, economic and technical forces influence urban growth, and the ensuing morphology. Thus the urban areas avoid
Stagnancy by remaining relevant in a contemporary setting. Change in the past has been slow and gradual with the old yielding to the new, moderated by unwritten social controls (Rashid & Rashid, 1996). However, the present rapidity and the impact of it on the built environment are vital concern of the conservationists, professionals and policy makers, not change per se.
Transformation to housing, a physical manifestation of society's culture that is dynamic, is an inevitable response to changing needs brought by socioeconomics of survival. As universally observed, families require satisfactory dwelling environment throughout their respective life cycles. Housing
Shifts in population distribution and mobility, and economic and political forces have changed societies and the urban environments in Abuja and Dhaka - cities of developing countries. Today, in large cities with high demographic and social mobility, neighbors have become strangers, individual identity is lost, and the feeling of community and pride in ones own place are gone (Rahman & Islam, 2004). Socially accepted unwritten controls on the environment and people no longer exist. The dynamics of change has divested the community of the socially accepted framework; there is no mechanism to manage it without loosing the essential character.

Migration of rural destitute to the urban centers of the developing world is a common phenomenon, putting pressure on the existing amenities to meet the needs of these people, mostly with low affordability that confines them to substandard housing. It is also common to transform the old dwellings to accommodate this particular group of poor migrants turned unskilled workers in many developing world cities like Dhaka. Some social scholars (Castells, 1985; Flanagan, 1990) cited a number of factors for such transformation, e.g. breaking down of the family structure from extended to nuclear, the diminishing of guild system, the diversity of the jobs and the peoples' mobility; the high maintenance cost of the old dwellings, and finally the suitability of such dwellings to be converted into smaller rental units. All these with varying degrees exist in the said cities.

In everyday life and language, the experience of spatial formation is intrinsic, if we experience society in an unconscious way (Rahman & Haque, 2001). Psychological, social and cultural characteristics are often expressed by the separation of various groups in localities (Rapoport, 1969). From the past to the present, society played the basic role in the formation of a settlement that modulates the space from basic behavioral level to the social level. This in turn is shaped by society that retains the basis in forming the space, where it physically exists. Space ostensibly physical entity, conserves the social structure within it, guided by the psychological and cultural norms to transform into a non-abstract entity (Rahman & Haque, 2001).

The paper mainly contains four sections. Within the introduction is background of the research sites, Peri-urban Abuja, Nigeria and old Dhaka city, Bangladesh. The theoretical orientation of housing transformation relevant to this paper follows. The next two parts deal with the study findings in Dhaka and Abuja. The last section analyses the similarities and differences between the pair of settings, and concludes the paper with implication of transformation apparent patterns in terms policy and housing delivery practice.

Core Dhaka Settlements

Dhaka, a city older than when it was first recognized as the capital of Mughal province of Bengal in 1608, has gone through Mughal, Colonial and Pakistani rule before becoming the capital of independent Bangladesh in 1971. With around 14 million people increasing at 4%+ rate, it is destined to be the 4th largest in the world by 2020. Like typical developing world's mega cities, Dhaka is plagued with poverty, migration, unplanned growth, poor services, pollution and ill governance. The old core at the south on the river is one of the densest areas in the world, with narrow alleys, crumbling infrastructure, and thousands of neglected traditional buildings that provide refuge to low-income families. The society, predominantly Muslim with about 15% Hindu, is culturally homogenous, though there is a wide disparity between income and education.

Dhaka's warm-humid climate has four distinct seasons with long monsoon and temperature variation of 10-40^{0}C making climate an important factor for the house form. Considerations like south wind, cross ventilation, adequate rain protection and shade etc. are essential in architecture. Introvert rooms around courtyards, a replica of rural form, creates a pleasant microclimate, and ensures necessary light and ventilation in traditional urban houses by acting as a cool sink (Mallick & Huda, 1996). Most parts of these houses are thus single room depth with a veranda (Rahman & Haque, 2001).

Conclusion

Conservation of the old buildings by saving them from the developers would not be possible without intervention by the public authorities enforcing strong rules. Building public consciousness regarding the preservation of architectural and cultural heritage would be crucial here. This paper showed an alternative way to continue the traditional use of old buildings and enhance their income in the process to the owners with emotional attachments. Thus subdividing of the existing building and renting those out to middle income people could defer the aggression of the developers in Old Dhaka and Peri-urban Abuja. However, many alternations and changes done in the interiors in the process may not have followed proper method so that intricate details could be preserved (Rahman, 2009). Conserving old buildings is an urban design issue that deals with not a single building, but a particular neighborhood or an area. However, it is not possible for the public authority to handle this alone, private sectors also should come forward and take initiatives especially for a city like Dhaka and Abuja.

The composition and typology of the traditional housing pattern presented in this research shows that this housing is a product of a simple and frugal society creating its habitat within its basic means, but with utmost understanding of the functional requirements and the potential of the materials at its disposal. The transformation of the ideal traditional dwellings with its three semantic variations for Muslims, Christians, Hindu and pagans to more functional economic models of the 21st century are honest adaptations to needs and

context. Artistic quality of the dwelling housings created in the transition period of the late eighties and early nineties were indigenous adjustments inspired by cultural changes within the dictates of economy of efforts.

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AGRICULTURAL LANDUSE PLANNING BASED ON TERRAIN CHARACTERISTICS USING REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM IN THE LOWER RIVER BENUE FLOODPLAIN, NIGERIA

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***Key words**: Landuse planning, terrain characteristics, river floodplain, remote sensing and GIS*

Introduction

Agriculture plays a dominant role in the economies of both developed and developing countries. Whether agriculture represents a substantial trading industry for an economically strong country or simply sustenance for a hungry, overpopulated one, it plays a significant role in almost every nation. The production of food is important to everyone and producing food in a cost-effective manner is the goal of every farmer, large-scale farm manager and regional agricultural institutions. A farmer needs to be informed to be efficient, and that includes having the knowledge and information products to forge a viable strategy for farming operations. This information will help the farmer to understand the health of his crop, extent of infestation or stress damage, or potential yield, soil conditions among others.

Aim and Objectives

The major aim of this study is to apply Satellite Remote Sensing and Geographic Information System technologies in agricultural landuse planning on the basis of terrain characteristics in the Lower River Benue floodplain, Nigeria. The specific objectives of the study are as follows:

To prepare landuse and landcover map using Landsat ETM data

To prepare physiographic- soil map

To generate slope, DEM and 3D maps of the area using topographic and SRTM data

To generate drainage and sub-watershed maps for the analysis of morphometric parameters of the sub-watershed using GIS

To assess land capability and paddy crop suitability of the area for agricultural landuse planning

Application of Remote Sensing and GIS Agricultural Land Use Planning

A good knowledge of landuse of any given area has to do with the human activities on land, the facilities placed on the land, the effects of such human activities on the environment and the actual people making use of the

land under consideration. The use of Satellite Remote Sensing for data gathering, allied to the introduction of Geographic Information System (GIS) as a powerful tool to process data in conjunction with information collected using traditional field techniques helps overcome traditional data volume constraints (Burrough 2005). According to Lillesand and Keifer (2006) remotely sensed data as well as traditional techniques permit the preparation of base maps including terrain evaluation, land use classification, land degradation maps and a host of other aspects. Agriculture and associated vegetative phenomena are dynamic; a correct appraisal of conditions at any time is essential for forecasting trends and patterns in land cover, processes and yield/biomass. The synoptic view and the repetitive cover afforded by satellite data allow multi-temporal observation of seasonal changes. To make best use of such information, it is necessary to combine it with other data. The need for integrating Satellite Remote Sensing, earth-bound survey, cartography, statistical and analytical techniques is readily apparent and is manifest through the adoption of GIS and databases within all agricultural landuse assessment methodologies. These systems and methodologies represent an essential tool for the enhancement of agricultural management techniques and structures.

The Study Area

The area of study is located between Latitudes 7^{o} 13'N and 8^{o}00'N and Longitudes 8^{o} 00'E and 9^{o} 00'E with a total basin area of 7685.28km^{2} and a population figure of 1,947,138 people (NPC, 2006). The rainy season lasts from April to October with an average annual rainfall of 1152.5 mm, mean annual temperature of 27.9^{O}C, Average annual humidity of 59.6% and mean monthly sunshine of about 7 hours *(Chart 1).* River Benue which rises from the Adamawa Plateau of Central Cameroon, then flows west across Central Nigeria, and joins River Niger is the main drainage feature in the area *(Figure 1).* Geologically, it is a sedimentary basin that is made up of alluvium, shale, sandstones, siltstones and coastal sand plains. It is consists of guinea savanna vegetation type with scattered woodland, shrubs and grassland as well as ferruginous soils which can be sub-divided on the basis of texture of the surface horizon into the hydromorphics, the lithosols and laterites

CONCLUSION

Knowledge of land use and terrain characteristics is important for agricultural planning and management activities concerned with the surface of the earth. The resource managers and planners for agricultural land use need detailed, timely, accurate and reliable data on the extent, location and quality of land and water resources as well as climatic characteristics. The data on landuse potential and the conservation needs can help in planning for uses that will maintain the quality of land and guarantee high productivity. The application of satellite remote sensing and geographic information system for land use surveys and mapping has gained importance largely because of its ability to provide rapid and reliable data within a given time framework.

In this study, this classification is made primarily for agricultural purposes and it enables the farmers in the Lower Benue River floodplain to use the available land according to its capabilities and to treat it according to its needs. Land is arranged in various capability classes after considering a number of soil characteristics and associated land features and climate. The main soil characteristics that were taken into account are texture; depth, permeability and other important associated soil features such as slope, erosion risk, drainage, frequency of overflow etc.

Land capability and suitability maps with explanatory legends, together with the tables and charts have provided the most satisfactory means of conveying the results of evaluation to the audience in summary form. A supporting text also helped to explain the procedures used, and have given descriptions of the types of land use, their management and improvement specifications, and their economic and social consequences, as well as have recorded the data and assumptions on which the evaluation was based. Area coverage of the land suitability classes for paddy (rice) cultivation as indicates that about 20% of the area is suitable for the cultivation of rice crop in the study area which corresponds to the nearly level sloping land. It has become increasingly apparent that computer based GIS and remote sensing data can provide the environment for effective land suitability evaluation not only for paddy crop but also for a variety of other crops and sundry

landuse types. To assess the reliability of the methodology, the suitability classes has to be checked against the rice yield, hence this will need further investigation to establish the resultant effect in relation to rice yield.

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SUSTAINABLE STRATEGY FINANCING FOR SUB-SAHARA AFRICAN ENVIRONMENTAL PROJECTS

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ABSTRACT
A growing awareness for the need for finance in order to implement active public policies on environmental project will require nations' and local agencies' pro-active financing strategy. Awareness will facilitate to create more sustainable economic structures and processes to combat ecological crises. Financing environmental projects should consciously gain national consciousness and action. Denying being conversant with feasible environmental project and available financing strategy is to further jeopardize prevalent environmental challenges. This study is a survey of environment strategy financing available to Sub Saharan countries' environmental projects particularly Water Supply, Waste Water Treatment, and Urban Solid Waste Scheme.

Key words: Environmental projects, Water Supply, Waste Water Treatment and Urban Solid Waste Scheme

BACKGROUND
The high population growth of most Sub-Saharan countries has witnessed by far little commensurate growth in urban city infrastructure and services such Water Supply, Waste Water Treatment and Urban Solid Waste Scheme. Urban dwellers have not been adequately provided with water supply, waste water and essential infrastructural facilities and services. Also, there have not been adequate coastal zone development and management to cater for particularly, solid waste such as organic solids and plastic components in urban cities. Consequently, wastes are discharged in water bodies, or into rivers and beaches. These in turn cause health hazards and degradation to marine life which cause mortality to marine organisms, mammals and sea birds.
Most developing nations have undertaken the financing of environmental projects to provide these much needed facilities and services. Financing capital expenditure of these projects has been 'characterized by reliance on shrinking public budgets, user charges significantly below cost recovery levels, non-transparent and inefficient subsidy schemes' (OECD/DANCEE, 2003). Furthermore, there have been few donor financing assistance and little participation from the private commercial sector of the economy. It is rightly observed that such financing is unsustainable such that maintenance breakdown and entire projects eventually wind up. It is observed too, that while government and agencies develop specific programmes with relevant estimates attached to project for inclusion into budget instruments, projects end up being underfunded. Environment financing has continued to feature as an important issue in both developed and developing nations, and probably more acute in most sub-Saharan Africa nations including Nigeria. It is considered that there should be an appropriate mix of policy, institutional and investment actions to address environmental problems in the most effective and efficient way. Specifically, this study aims at examining existing public financial resources for environment more efficiently and to mobilize additional financing from private and public resources for enhanced sustainability.

The Sub-Saharan Africa environment situation is the focus of this paper, specifically the West Africa and East African nations of Nigeria, Kenya, Ghana, Tanzania, Uganda, Democratic Republic of Congo, Congo, Gabon, Central Africa Republic, Ethiopia, Sudan, Cameroun, Togo, Benin Republic, Cote D'Ivoire, Liberia, Sierra Leone, Guinea, Senegal, Gambia, Burkina Faso, Mali, and Niger Republic
The approach in the study after considering the study background, is the literature framework, **study discussions,** financing strategies for environmental projects and finally study recommendations

CONCLUSIONS AND RECOMMENDATIONS

Government budgetary allocations to environmental projects and programmes can only be assured if environment is a set priority. Consistency of allocation will add to achieving set targets from time to time. However, since budgetary allocation will not always be adequate and since governments will have other emerging priorities in ensuing years, environmental project and programme evaluation must factor into it funding and financing, sustainability.

There should be focus on the private sector profit making corporations essentially through environmental user fees or charges for private sector impact on environment through their activities.
Donor environmental funds' beneficiary nations in their environmental programme evaluation should establish the general trend in the availability of such funds for particular environmental issues and the knowledge of the availability of such funds. These will foster their plans and actions to be taken by the particular government of the nations executing agency to secure supplementary funds needed to ensure sustainability of programme or project objectives and results.

Local resources need to be available to replace donor funding as current project input is halted, as donor funding declines or is completely withdrawn. The phasing in of local resources and phasing out of donor funding must be foreseen and built into the project or programme design.

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GLOSSARY OF KEY WORDS

Environmental Projects

Environmental projects as used in this study are projects meant to conserve use of natural resource, prevent and control land pollution, support urban sprawling, assist waste disposal incidents, such as water supply, Waste Water Treatment, Urban Solid Waste Scheme and Land Mass Transportation

Water Supply

Water supply is the self-provision or provision by third parties in the water industry commonly a public utility of water resources of various qualities to different users. Clean drinking water means access to an improved water source as against sources such as unprotected wells or springs, canals, lakes or rivers to fetch water.

Domestic wastewater treatment

'Domestic wastewater treatment or Sewage treatment is the process of removing contaminants from wastewater and household sewage, both runoff (effluents) and domestic. It includes physical, chemical, and

biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a waste stream (or treated effluent) and a solid waste or sludge suitable for discharge or reuse back into the environment' (Wikipedia, The free Encyclopedia)

Urban solid waste

'Urban solid waste also called Municipal solid waste (MSW), is a waste type that includes predominantly household waste (domestic waste) with sometimes the addition of commercial wastes collected by a municipality within a given area. They are in either solid or semisolid form and generally exclude industrial hazardous wastes. The term *residual waste* relates to waste left from household sources containing materials that have not been separated out or sent for reprocessing' (Wikipedia, The free Encyclopedia).

BIOREMEDIATION: A SUSTAINABLE ECO-FRIENDLY BIOTECHNOLOGICAL SOLUTION FOR ENVIRONMENTAL POLLUTION IN OIL INDUSTRIES

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ABSTRACT

The oil industry effluents, oily sludge and oil spills on land and water cause a major threat to the environment as their constituents have toxic, mutagenic and carcinogenic properties. With the stringent regulatory norms and environmental obligations, the oil industries have taken initiatives for proper management and treatment of these hazardous wastes. Different conventional approaches like Land filling, Incineration, Air Spurging, Natural Remediation, Land farming, Surfactants, Chemical dissociation, Dumping in injection wells etc., have been tried since early times to overcome this problem. However none of these methods are the permanent eco-friendly solution and some of them are not cost effective. Therefore, environment friendly technologies are increasingly in demand today for oily waste management.

Application of biological methods have been well reviewed and acknowledged for reclamation and remediation of environments contaminated with petroleum hydrocarbons. After extensive research, The Energy and Resources Institute(TERI), has developed an indigenous bacterial consortium, named Oilzapper, by assembling four different bacterial species, isolated from various oil contaminated sites of India, which could degrade different fractions of total petroleum hydrocarbon (TPH) of the oily waste. The end product of bioremediation is CO_2, water and dead biomass which is environment friendly. Oilzapper technology has been applied by TERI for bioremediation of oily wastes like crude oily sludge, emulsified oily sludge, oil contaminated land and water in various oil installations of different climatic conditions in India. TERI has also developed other bacterial consortia depending on the type of oily waste like, Oilivorous – A for acidic oily waste, Oilivorous – S for high sulfur containing oily waste, Oilzapper- D for oil contaminated drill cuttings and oil based muds, etc. TERI has also developed indigenous microbial consortia for bioremediation of oil contaminated land at Kuwait and oil contaminated drill cuttings at Abu Dhabi.

Bioremediation has been proven to be the most eco-friendly and economically viable method for management of hazardous oily waste. Using bioremediation technology, TERI has treated more than 1,50,000 tonnes of different types of oily waste around the world and more than 60,000 tonnes of oily waste is under treatment. This has added up to more than 100 field case studies of different batch size on in-situ as well as ex-situ bioremediation process by TERI. The initial TPH content varied from 5% to 52%, which has degraded to less than 1% TPH in almost all the cases. The time for bioremediation process was found to be 2 – 6 months depending upon the initial TPH content, type of oily waste and particular climatic condition of the bioremediation site. The bioremediated soil was found to be non-toxic and natural vegetation were found to be grown on the site after bioremediation indicating the regaining of soil fertility. Fish culturing was done in one oil contaminated lake after bioremediation, where different fish species were found to be grown and survived very well and healthy. Bioremediation technology has helped various oil industries for the management of their hazardous wastes. The bioremediation by Oilzapper technology is an ongoing investigation and the results are highly encouraging.

KEYWORDS: Bioremediation, Biodegradation. Oily waste, Oilzapper, Total Petroleum Hydrocarbon.

ABOUT TERI, INDIA:

The Energy and Resources Institute (TERI) established in 1974 is a dynamic and flexible organization with a global vision. TERI is deeply committed to every aspect of sustainable development. While TERI's vision is global, its roots are firmly entrenched in Indian soil. All activities in TERI move from formulating local and national level strategies to suggesting global solutions to critical energy and environment-related issues. TERI's Microbial Biotechnology is actively working on petroleum biotechnology to cater to problems of oily sludge management, microbial enhanced oil recovery, microbial diversity, Microbial paraffin degradation, Microbial incuced corrosion in oil and gas pipelines and their control, Bioethanol, Biodegradable Plastic, Biohydrogen, microbial production of Coal Bed Methane, Probiotics, Medical Biotechnology etc. To know more about TERI please visit at www.teriin.org.

INTRODUCTION :

The Hydrocarbon sector, worldwide has been undergoing radical changes leading to increased industrial activity in the area of hydrocarbon processing like Exploration, Drilling, Processing and Refining process. This increase has also led to increase in generation of oily wastes (sludge), contaminated sites and also wastewater. The various types of oily wastes generated in Oil Refineries includes crude tank bottom sludge, American Petroleum Institute (API) separator sludge, DAF (Dissolved Air Floatation) sludge, slop oil emulsion solids, cooling tower sludge, chemical and bio sludge. Besides this, industries concerned with oil exploration and drilling, storage terminals and oil depots also face the problem of sludge generation and disposal. During the activity contamination of wastewater stream and land occurs which is highly hazardous to the environment. Oil transportation is one of the major cause of environmental pollution by the oil industries where the land and water environment gets polluted due to oil spill, ship breakage and leakage of oil pipelines. In UK , the ecology of North Sea has been devastated by over 30 years due to oil spill incidents. Recent BP oil spill at the Gulf of Mexico (April 2010) is considered to be the largest oil spill in US history where oil being discharged in the range of 12,000 to 100,000 barrels per day. By April 25, 2010, the oil spill covered 580 square miles (1500 Km^2) which has increased to the total spread of 3,850 square miles (10,000 Km^2) by April 30, 2010. Due to war enormous quantity of land and sea water gets contaminated by oil. This has severe impact on the natural environment (e.g. Gulf War 1991). Not only India, but the US EPA (Environmental Protection Agency) and OECD (Organization for Economic Co-operation and Development) Countries also designated oily wastes as hazardous wastes.

RESULTS AND DISCUSSION

Composition of oily sludge

In initial oil content in terms of solvent extractable TPH in the case studies varied from 5% to 52% in the field case studies. The remaining part was moisture and residual soil. The steam extractable TPH in the oily sludge was found to be nil. TPH extracted from the oily sludge contained 40 - 70% alkane fraction, 15 - 30% aromatic fraction, 5 - 15% heavy fractions like NSO asphaltene, resins etc. Table – 3 below describes the detailed composition of the oily waste undertaken in one of the case studies in India.

Table- 3 : Composition of Oily waste undertaken for the bioremediation job at CPF, Gandhar, ONGC Ankleshwar Asset, India:

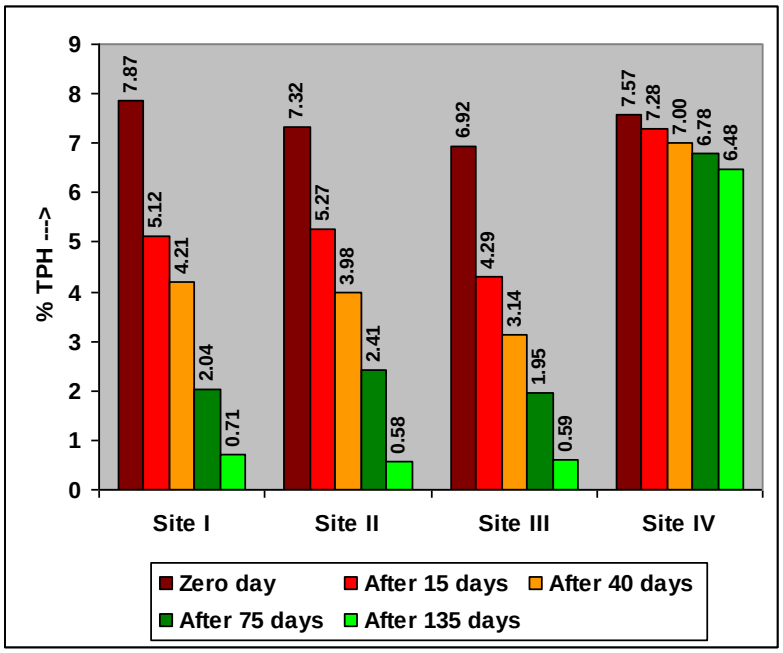
Constituents of crude oil/ oily sludge	Composition (%)
Steam extractable total petroleum hydrocarbon (TPH) in crude oil/oily sludge	Nil
Solvent extractable TPH in crude oil/oily sludge	44.65

Water content in crude oil/oily sludge	27.12
Heavy fraction of hydrocarbons	22.14
Sediments/inorganic	6.09
Constituents of TPH	
Alkane fraction	68
Aromatic fraction	20
NSO & Asphaltene fraction	12

Biodegradation

After complete application of the microbial consortium to the bioremediation sites, it was observed that within 2 - 6 months period the TPH content of the oily waste has been biodegraded to less than 1% indicating more than 95% biodegradation in almost all the case studies. Whereas the degradation of oily waste in the control sites were hardly 5 – 15% in the same time period. Figure – 1 & 2 below describes the trend of biodegradation in two of the case studies. Figure – 3 & 4 below describes the GC chromatograms indicating the biodegradation of the alkane and aromatic fraction of the oily waste in one of the case studies. This indicates that the bioremediation process by using the microbial consortium is an efficient process for degradation of oil contamination.

Figure – 1: Biodegradation of TPH of oil contaminated soil at South Santhal CTF, ONGC, Mehsana Asset, India. Site – I, II & III are experimental sites and Site – IV is control site where no Oilzapper was applied.



pH and microbial count of the oily sludge samples at the bioremediation site

Throughout the bioremediation treatment process, pH of the samples was within 6.5 to 8.8 in all the cases, except in the case of acidic oily sludge. The microbial counts were maintained in the range of 10^7 to 10^9 CFU per gram of sample in the experimental bioremediation site. However, in the control site the microbial count was found to be in the range of 10^2 to 10^4 CFU per gram of sample.

Ground water quality

The pH in all the ground water samples were within 7.5 to 8.5. In all the samples the oil and grease was found to be nil. This indicated that there was no leaching of oil to the underground water.

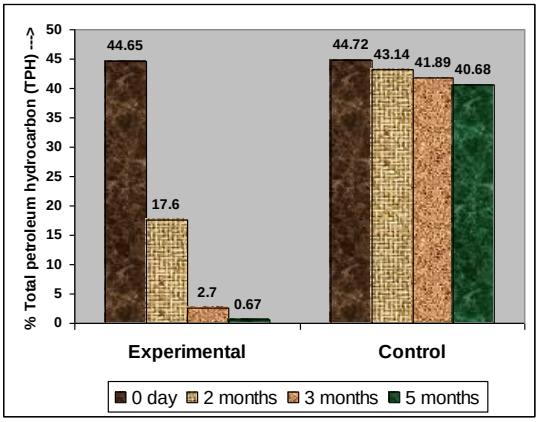


Figure – 2: *Biodegradation of TPH of oil contaminated soil at CPF Gandhar, ONGC, Ankleshwar Asset, India.*

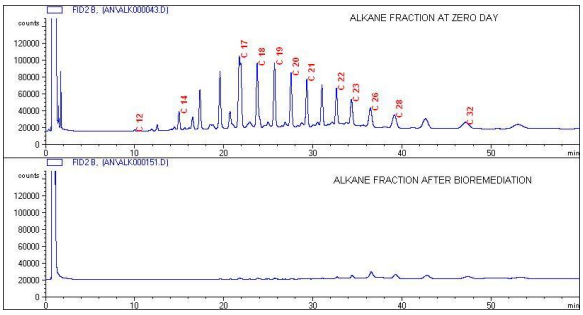


Figure 3 : *GC chromatogram indicating the biodegradation of alkane fraction of TPH at CPF Gandhar, ONGC, Ankleshwar Asset, India.*

Heavy metal analysis

All the heavy metals before and after bioremediation were within the permissible limit as per Hazardous waste (management & handling) rules, amendment 2008, of India. However there was no sign of biodegradation of heavy metals.

Soil Toxicity:

The bioremediated soil was tested for soil toxicity as per the method described above. It was observed that the bioremediated soil was not found to be toxic. There was no death of fish in the fish toxicity test in 10% leachate of the bioremediated soil. Also natural vegetation was found to be grown on the site after bioremediation. In one case study various vegetable and fruit species was grown successfully on the oil contaminated site after bioremediation (Figure – 5). In one oil contaminated lake fish culturing was done after bioremediation. Various fish species was found to be grown healthily and survived for long time. The fish species were tested for bioaccumulation of toxic component of hydrocarbons in the fish tissues. There was no traces of accumulation of petroleum hydrocarbon component was observed in the grown fish species (Figure – 6). Hence bioremediation by Oilzapper helps in ecorestoration of the hydrocarbon contaminated sites.

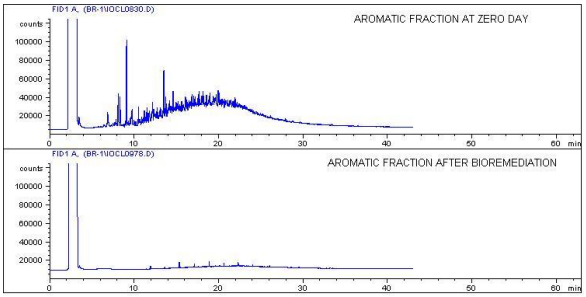


Figure 4 : *GC chromatogram indicating the biodegradation of alkane fraction of TPH at CPF Gandhar, ONGC, Ankleshwar Asset, India*



Figure – 5 *: Bioremediation site near GC-2 at Burhan, South Kuwait Oil Field, Kuwait Oil Company (KOC), Kuwait.*

SUMMARY

Oil and gas industries contributes to major industrial pollution. Various preventive measures are taken care by the industries to minimize the environmental pollution. Bioremediation has been found to be the most environment friendly method for treatment of oil contamination generated due to various petroleum industries. It is the most cost effective technology. Using bioremediation technology TERI, India, has treated more than 1,50,000 metric tonnes of oil contamination at various oil installations in India and abroad and more than 60,000 tonnes of oil contamination is under treatment by bioremediation. Bioremediated soil has been found containing TPH content to the extent of <1%. Bioremediation technology has helped the oil industries in ecorestoration of the hydrocarbon contaminated sites.

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Oil contaminated lake before



Oil contaminated lake after



Natural vegetation on oil contaminated lake after bioremediation



Fish grown on oil contaminated lake after bioremediation

Figure – 6 : *Eco-restoration of oil contaminated lake by bioremediation technology at North Kadi, Mehsana Asset, of Oil and Natural gas Corporation Limited (ONGC), India.*

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THE POTENTIAL OF SAWDUST AS AN INSULATOR IN A DOUBLE WALLED METALLIC SILO

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Abstract

Sawdust is one of the major residues from sawmilling industry. The saw mill sector currently disposes off some of its residues (sawdust, bark and planer shavings) through environmentally incorrect means with only a small amount used as litter in the poultry industry. The major disadvantage in the use of metallic silo for grain storage is the temperature fluctuations within structure, results in its deterioration. This work investigates the potential of sawdust as an insulator in a double walled metallic silo. This is with a view to solve the problems of environmental pollution from the sawmilling industry as well as reduce losses of grain stored in metallic silo.

A 350kg double-walled metallic silo was designed and constructed using galvanized iron sheet with sawdust as insulating material between the walls. The silo has a total height of 2.70metres above the ground level with an internal and external diameter of 0.80metres and 0.90metres respectively. The silo consists of four major sections viz – the roof, cylindrical section, conical hopper and foundation. A pre-storage evaluation was carried out on the silo to ascertain the potential of sawdust as an insulator prior to grain storage. Temperature differences between the silo and the ambient as well as along the height were monitored three times daily over a period of thirty days.

The result shows a temperature range of 19-40.7^{o}C and 22.5-42.5^{o}C inside the silo and ambient respectively. Statistical analysis revealed significant difference ($p<0.05$) in the temperature range in the silo and ambient during the test period. The double-walled sawdust insulated metallic silo demonstrated some prospects for use in grain storage especially in the reduction of temperature fluctuations within the silo. This in turn will help solve the problems of sawdust disposal in Nigeria.

Keywords: Thermal conductivity, silo, sawdust, temperature, waste

Introduction

Sawmill industry is very essential in the utilization of wood for both domestic and commercial purposes. Sawdust is the powdery wood waste produced by cutting wood with a saw. The size of the sawdust particles depends on the kind of wood from which the sawdust is obtained and also on the size of the teeth of the saw (Afuwape, 1983). Between 10 and 13% of the total content of a log is reduced to sawdust in milling operations; this depends largely on the average width of the saw kert and the thickness of the timber sawed. Sawdust has low thermal conductivity, which ranges between 0.06 to 0.12W/mK. Thermal conductivity of sawdust is a function of the wood specie. The saw mill sector currently disposes off some of its residues (sawdust, bark and planer shavings) through environmentally incorrect means, with only a small amount of sawdust is used as litter in the poultry industry and cooking in sawdust stoves.

Sawdust is readily available in large quantities as wastes in majority of the wood processing industries. It has been proposed that the conversion of sawdust wastes through briquetting process is one of the ways of reducing waste disposal problems in majority of the wood processing industries. Furthermore deforestation which promotes pollution will be drastically reduced if the use of sawdust waste is enhanced. The use of sawmill residues must be carefully analyzed to offer the best technical, economic and environmental alternative. The characterization (quantity, type, chemical and energetic analysis) of the residues generated, in addition to the energetic needs of sawmills, is essential to determine which technology is more suitable.

Modern bulk storage of grains in Nigeria is often done in imported metallic silos because of their large unit capacities which could be as much as 500 tonnes (Talabi, 1996). There are a number of construction materials such as steel, aluminum, concrete, wood rubber, and clay etc; the common commercial silos in use in Nigeria are constructed of steel and aluminum (Mijinyawa, 1999). In the warm and humid climate prevalent in Nigeria, metal silos which are the predominant structures used for grain storage in strategic grain reserves, experience moisture condensation and high temperature fluctuations, resulting in grain deterioration. Although silos are the most appropriate modern structures for the bulk storage of grains, their performances are greatly influenced by the materials of construction and the climatic environment where they are used. Under the warm and humid environment prevalent in Nigeria, these silos of temperate region origin, although purchased and stocked at very high costs, experience moisture condensation, hot spot development, high temperature fluctuation and caking which results into grain deterioration (Mijinyawa *et al.,* 2007).

The low thermal conductivity of wood products of about 0.12 W/(mK) (Parrish, 1973) and their availability most especially in Southwestern Nigeria encouraged their consideration for use in silo construction (Alabadan, 2002). Mijinyawa (1989) and Alabadan (2006) investigated the potentials of wooden silos in reducing temperature fluctuations. They found that temperature fluctuations obtained within the wooden silos were lower than for those in metal silos. However, the difficulty in making the joints tight in order to eliminate crevices where insects could hibernate constitutes one of its disadvantages. Termites build their tunnels from the soil into the wooden structures leaving the surface untouched which makes it difficult to detect an attack in the early stages (John*,* 1995).

A 350kg double-walled metallic silo was designed and constructed using galvanized iron sheet with sawdust as insulating material between the walls. The silo is located in the experimental field of the Department of Agricultural Engineering, Ladoke Akintola University of Technology Ogbomoso, Nigeria. The silo has a total height of 2.70metres above the ground level with an internal and external diameter of 0.80metres and 0.90metres respectively. The silo consists of four major sections viz – the roof, cylindrical section, conical hopper and foundation (Plate 1). The body of the silo comprises of two cylinders (outer and inner) of diameters 0.90m and 0.80m and length 1.22m and 1.18m respectively. Sawdust was placed in the space (5cm) between the two walls to serve as an insulating material. The main objective of constructing a double-walled silo is to reduce temperature fluctuations between the environment and the silo enclosure thereby reducing the effect of condensation that could lead to faster spoilage of the stored grains. This work investigates the potential of sawdust as an insulator in a double walled metallic silo due its low thermal conductivity. The utilization of sawdust in this structure will help reduce the problems of waste disposal and environment pollutions emanating from the sawmilling industry.

Results And Discussion

The results show that there are differences between the temperature within and outside the insulated silo as shown in Figure 1. This is an indication that there is resistance to temperature influx into the silo from the outside, which shows that the low thermal conductivity of the sawdust has reduced the heat transfer into the silo. Temperature within the silo was also found to be affected by the time of the day at which readings are taken (Figure 2). Naturally lower temperatures were recorded in the mornings than in the afternoon; this also has direct effect on the temperature within the silo. The result shows a temperature range of 19-40.7^{o}C and 22.5-42.5^{o}C inside the silo and ambient respectively.

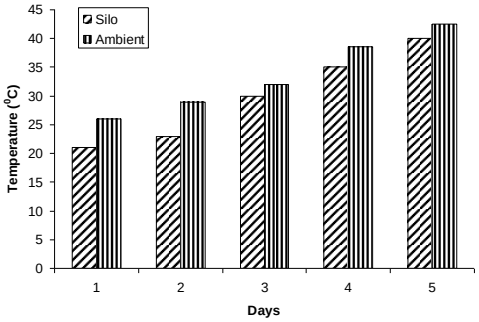


Figure 1: Average temperature within the silo and ambient condition at 3.30pm

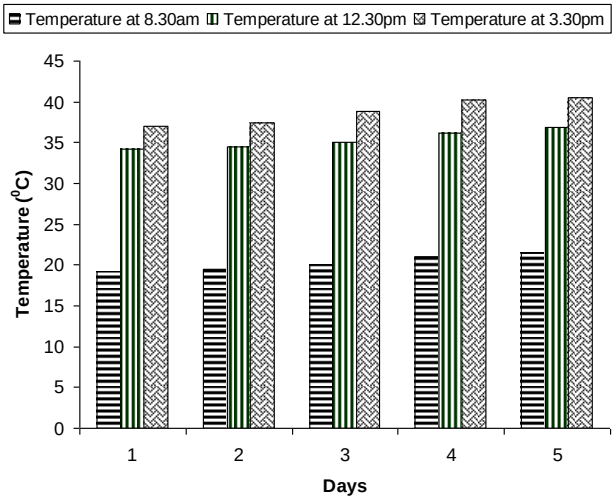


Figure 2: Average temperature variation within silo at different time of the day

The statistical analyses show that there significant difference between the temperature within the silo and the ambient as shown in Table 1. The Duncan test (Table 2) showed that temperature in the silo at 8.30am is the lowest and the highest at 3.30pm at the ambient. There are no significant difference between the temperatures of the silo at 12.30pm and the ambient at 8.30am. There are however differences in all the temperatures in the ambient and silo from 12.30pm to 3.30pm.

Table 1: Anova for the temperature difference between the ambient and silo

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1365.167	5	273.033	45.585	.000
Within Groups	143.748	24	5.990		
Total	1508.915	29			

Table 2: Duncan test for temperature variation between the silo and the ambient

	Time	N	Subset for alpha = .05				
		1	2	3	4	5	1
Duncan	Silo at 8.30	5	20.2000				
	Ambient at 8.30	5		24.9000			
	Silo at 12.30	5		27.0000			
	Ambient at 12.30	5			31.2000		
	Silo at 3.30	5				36.4000	
	Ambient at 3.30	5					39.9800
	Sig.		1.000	.187	1.000	1.000	1.000

There are significant differences in the temperature within the silo as shown in the analysis of variance Table 3. The temperature increases with the time of the day, with the lowest at 8.30am and highest at 3.30pm (Table 4).

Table 3: Anova for the temperature difference within the silo

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2917.968	2	1458.984	714.566	.000
Within Groups	85.755	42	2.042		
Total	3003.723	44			

Table 4: Duncan test for temperature variation within the silo

	Time	N	Subset for alpha = .05		
		1	2	3	1
Duncan	8.30	15	20.2600		
	12.30	15		35.3733	
	3.30	15			38.7933
	Sig.		1.000	1.000	1.000

Temperature was observed to increase from the bottom to the upper part of the silo (Figure 3).

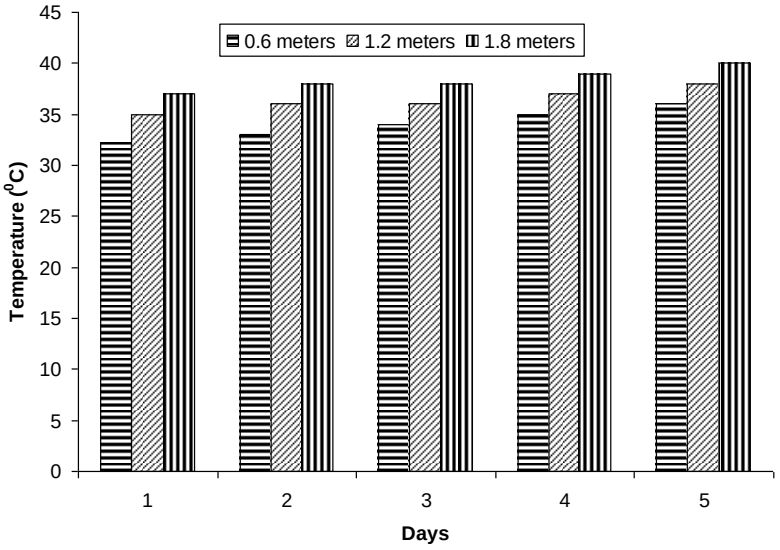


Figure 3: Average temperature within the silo along the height

The analysis of variance showed that there significant difference in the temperature within the silo (Table 5) with the increase in height. The Duncan test showed that the temperature at the lower part (0.6m) is lower (Table 6) and there is no significant difference between the temperature at 1.2m and 1.8m

Table 5: Anova for the temperature difference with height in the silo

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.565	2	9.283	5.674	.018
Within Groups	19.632	12	1.636		
Total	38.197	14			

Table 6: Duncan test for temperature variation with height in the silo

	Silo height	N	Subset for alpha = .05	
		1	2	1
Duncan	0.6	5	34.0400	
	1.2	5		36.4000
	1.8	5		36.4000
	Sig.		1.000	1.000

Conclusions

The insulated double-walled metallic silo demonstrated some prospects for use in grain storage; especially in the reduction of temperature fluctuations within the silo due to the low thermal conductivity of the sawdust.

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DEFORESTATION IN OBUBRA LOCAL GOVERNMENT AREA: THE CHALLENGES BEFORE THE CROSS RIVER STATE ANTI-DEFORESTATION COMMISSION

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Abstract
There is no gainsaying the fact that our environment is facing the greatest challenge ever in its long history; and many are forced to believe that human activities are a major cause of the climate change and global warming, which may have catastrophic consequences for the climate and the environment. For instance, rising temperatures could intensify storms, floods and droughts. Rising temperatures may also foster the spread of diseases by enabling mosquitoes, ticks and other disease-carrying organisms, including fungi, to spread. According to the Bulletin of the Atomic Scientist, ***"the dangers posed by climate change are nearly as dire as those posed by nuclear weapons; and the effects may be less dramatic now, but over the next three to four decades, climate change could cause irremediable harm to the habitats upon which human societies depend for survival"***. What do all these portend for our local environment? What benefits could be derived from the recently formed anti-deforestation commission and the planned House of Assembly Bill on Deforestation in Cross River State? This paper seeks to assess the effect of deforestation in Obubra Local Government Area of Cross River State taking into consideration the state policy on deforestation. It is hoped that the outcome of this presentation will assist stakeholders and government alike in fashioning out a sustainable policy for curbing the effects of deforestation and the rate at which our natural forests are being deforested.

Key Words: Deforestation; Obubra Local Government Area; Challenges; Forestry Commission; Cross River State

Introduction

> **"……. we did not inherit the environment from our fathers, but we have borrowed it from our children".**

There is considerable economic and political interest today in how the tropical rain forests are used. While some would preserve them in their current state, others would use the trees and other forest resources for economic gain, (Enger and Smith, 2002). And since tropical rain forests are located in countries in which there are large numbers of **poor** people, there are strong pressures to exploit forests for economic benefits. For instance, it is estimated that more than 80% of the inhabitants of Africa generally use wood for cooking. No wonder fire wood is such a lucrative business in so many parts of the country. It is also on record that Africa has the highest population growth rate; as a result, the territory around some villages and towns have been stripped of trees and other vegetation, since a majority of the citizens depend on their environment simply for survival. And most of the economic uses of the rain forest results in its destruction or reduction in forest biodiversity.

About two hundred years ago, tropical rain forest was known to cover about 1,500 million hectares (3,700 million acres) of the earth surface; but today only 90 million hectares (2,200 million acres) remain. Although exactly how much rainforest is disappearing is not known, it seems likely that over 20 million hectares (50 million acres) are destroyed each year. At this rate, is estimated that there will be no rain forest remaining 50

years from now. What does this portend for our environment and us? The slash and burn method of farming in Obubra Local Government Area in Cross River State will be used to address this very important issue.

Conclusion and Recommendations

The main thrust of this paper was to assess the challenges before the Cross River State anti-deforestation commission vis-à-vis the traditional farming methods in Obubra Local Government Area. Our study has shown that in Obubra LGA, there has been an alarming rate of deforestation for subsistence farming and other reasons mention earlier. This trend has given rise to different policies and management strategies (the most recent being the Cross River State Forestry Commission and the Forestry Management Committees) all aimed at curbing the rate of deforestation currently plaguing the state.

We further learnt that issues relating to forest in Cross River State had been gazetted as far back as the 1940's, an indication that concerns for the forest and the advantages inherent therein have been a matter of concern even to the Colonial administrators. The paper has also shown that governments take the lead in this threat to our environment, not withstanding the fact that governments also take the lead in making laws, legislatures, policies and strategies on forest matters. This is not surprising because the fact remains that the problem and solution to the destruction of the forest is economic and economic.

Nevertheless, efforts to stop or slow deforestation have been attempted for many centuries (**without success**) because it has long been known that deforestation can cause environmental damage sufficient in some cases to cause societies to collapse. In Cross River State for instance the state Forestry Commission and the Forestry Management Committees are some of such bodies set up in an attempt by government to forestall the illegal deforestation of the state forest and to encourage the sustainable sourcing of forest resources.

Our submission is that although these policies are well intended and have great potential for success, there should be proper surveillance of the state's forest by the agencies concerned. Government should put in place proper enforcement parameters so that these laws could be enforced. The local communities should be properly educated on the dangers of poor farming methods and the harm it is causing them and the environment. New farming methods should be developed and intensified by using high-yield hybrid crops, greenhouse building gardens, etc.

Finally, government should create greater awareness and sensitize the local communities through radio and television jingles; to drive home the point that if forest is destroyed, those who live there will lose the context of their culture as their habitat disappears. Let the farmers who cut the forest for croplands know that they will ultimately face economic ruin because most of the rain forest soils cannot sustain their farming for more than two years. They should also be aware that denuded and exhausted farmlands are often used for live stoke pasture, but this too is limited to only a few years. So as forests are lost, humanity will lose many potential food crops and medical products. We will also suffer a terrific aesthetic lose because Forestry is not all about trees, it is about people; and it is about trees only in so far as trees serve the needs of people.

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ENERGY PLANNING FOR SUSTAINABLE ENVIRONMENT IN NIGERIA

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Introduction:
The accomplishments of civilization have largely been achieved through the increasingly efficient and extensive harnessing of various forms of energy to extend human capabilities and ingenuity. Energy is similarly indispensable for continued human development and economic growth. Providing adequate, affordable energy is essential for eradicating poverty, improving human welfare, and raising living standard world - wide. And without economic growth, it will be difficult to address environmental challenges, especially those associated with poverty.
However and unfortunately, most developing nations of the world are not enjoying these benefits. Increasing access to clean and affordable energy services is highly complicated and expensive task that requires careful planning.
Poor planning (coupled with lack of commitment and political will for project implementation) has led to inadequate supply of energy services to the majority of the population; poor planning is also responsible for the inability to maintain the energy infrastructures, outdated network of electric generators (electric power stations), transmission lines, pipelines and refineries has been allowed to deteriorate. Oil pipelines and refineries are in need of repair and expansion. For example not a single major oil refinery has been built in Nigeria in nearly decades.
Most SME industries are closed down for lack of energy to operate; the big ones – the multinationals in most cases depend on their own energy system (IPP) and this makes their products very expensive and out of reach of the majority of the citizens. In addition to these challenges is the issue of adverse environmental impacts, which ranges from local deforestation driven partly by firewood consumption, oil spillages, water pollution to global warming caused largely by carbon dioxide emissions from energy use.

However, it has been discovered that the major organizational problem in many developing societies like Nigeria is lack of coordinated energy infrastructural planning, i.e. energy – related planning and decision making are scattered among public and private sector institutions such as Electric Power Authority, National Petroleum Authority or Private Oil or Gas Supply Companies, Power & Mining Authority, Town Planning Authority, Water Supply Authority, Industrial Development Authority, and others.
Often all of them pursue their own policies and agenda with little or no coordination and consideration of the effects of their policies on each other and the Country as whole.
Ideally, a single energy planning authority should determine overall energy policy and coordinate it all.
In Nigeria situation however, despite the fact that the National energy commission has sophisticated blue print for energy infrastructural development (**policy**) for the entire nation, one wonders why we are still where we are today.

This paper discusses the importance of planning, especially strategic planning in the provision of energy services in developing societies like Nigeria. In energy planning, there are analytical tools (Models) developed through dedicated research, development and demonstration (RDD) in electronics and computer simulation.
For years now, the IAEA has been championing the development of set of analytical tools (models) for energy planning, transferring them to the member states upon requests; this paper takes a look at these tools and how we improve on them and apply them to solve our energy problems.
Going through the models, none of the models actually addressed the issue of '**lack of coordinated energy development planning'** among public and private sectors mentioned above. The paper considers each of these models in relation to our energy challenges and how we can improve on them for the purpose of our peculiar situations. In conclusion, some suggested solutions are provided in the paper.

Energy is essential for all human activities, and its availability is critical to economic and social development. Energy is the engine for production of goods and services across all economic sectors. It is crucial to the provision of basic civic services in education, health care, clean water supply and sanitation, and also for wealth creation.

Lack of energy is a contributing factor to the poverty of individuals, communities, nations and regions. But however essential it may be for development, energy is only a means to an end; energy jointly with appropriate technologies and infrastructure, generates the services modern societies crave for (fast and convenient transportation, lighting, air conditioning, information exchange and processing, good health, sustainable economy etc.). Meeting the UN Millennium Goals can only be accomplished through access to affordable energy services

RECOMMENDATIONS AND SUGGESTIONS

From what have been said so far, to minimize our energy challenges, I humbly make the following recommendations and suggestions.

The National energy commission should be reorganized and empowered to function as its counterparts in the other parts of the world

All stake holders in energy development should be involved in the planning of energy development

I seriously advocate a coordinated planning among all the stake holders in the energy sector

All energy development vision and goals should be supported with enabling laws and must be backed with avowed commitment on the part of the Government

There must be political will and commitment for energy project implementation.

Every energy project must be given targets for completion backed by law.

I advocate for modernization and expansion of our energy infrastructure e.g. outdated national electric grid, both overhead and underground, aging power transformers, generation stations, transmission and distribution lines, gas pipelines, obsolete refineries, petroleum product distribution facilities etc.

I advocate for integrated energy planning for our nation

I advocate distributed electric power generation to boost our power generation capacity.

I advocate for dedicated research backed by adequate funding on renewable energy system

Encourage young Nigerians to study energy related programmes in higher institution to forestall shortage of manpower at the energy sector

Build more energy research centers.

CONCLUSION

In conclusion, for our energy to come on stream and to use it to better the life of the citizenry, all hands must be on deck; all stake holders must be involved in the energy development plan of the nation, region or the society. Planning must not be carried out in isolation

There must be commitment and determination on the part of the authority to provide enabling framework and ensure full implementation of all energy projects.

CLIMATE CHANGE AND GLOBAL WARMING: THE NIGERIAN PERSPECTIVE

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Abstract
Emphasis on climate change studies have been more on global whereas the effects are mainly at regional levels. It is on this premise that this study investigated climate change and global warming from the Nigerian perspective. Climatic data (Mean annual and monthly rainfall and temperature) from 30 synoptic stations, for 76 years were collected from the Nigerian Meteorological Agency, Lagos, between 1901-1938 and 1971-2008. Secondary data from different sources were also collected. These were analysed using time series, correlation and percentages among other statistical tools. The result shows that while temperature in Nigeria is increasing, the rainfall is decreasing. While global temperature for the past 100 years is 0.74^{O}C that of Nigeria between the two climatic periods under study is 1.78 ^{O}C. Major spatial shifts were observed for example, southward shift in the divide between the double rainfall peak and single rainfall peak, and temporal shift in short-dry-season from August to July in Southern Nigeria. The result also shows that although rainfall is generally decreasing in Nigeria, the coastal region is experiencing slightly increasing rainfall recently. The current available pieces of evidence show that Nigeria, like most parts of the world, is experiencing not only regional warming but also the basic features of climate change. To reverse the trend, sustainable developmental measures were recommended.

Keywords: Global warming, climate change, short-dry-season, temperature, rainfall peak, sustainable development.

Introduction
Intergovernmental Panel on Climate (IPCC) (2007) defines climate change as a change in the state of the climate that can be identified (eg., by using statistical tests) by changes in the mean and /or the variability of its properties, and that persists for an extended period typically decades or longer. Although the length of time it takes the changes to manifest matters, the level of deviation from the normal and its impacts on the ecology are most paramount (Odjugo, 2010). Climate change is the end product of a changing climate. Climate change is said to exist when the level of climatic deviation from the normal is very significant over a long period of time (preferably centuries) and such deviations have clear and permanent impacts on the ecosystem (Odjugo, 2009a; 2009b). It should be emphasized that global or regional climate has never been static but variability is an inherent characteristic of climate. For example, the global temperatures have changed from glacial through cold, moderate and warm during different geological times as shown in Table 1.

Table 1: Global climate since the pre-Cambrian period

Era	*Period*	*Age by radio activity in million years*	*Climate*
Quaternary	Recent (Holocene)	1	Glaciation in temperate latitudes
	Pleistocene		
Tertiary	Pliocene	13	Cool
	Miocene	30	Moderate
	Oligocene	60	Moderate to warm
	Eocene		Moderate becoming warm
Mesozoic	Cretaceous	110	Moderate
	Jurassic	155	Warm and equable
	Triassic	190	Warm and equable
Palaeozoic	Permian	210-240	Glacial, becoming moderate
	Carboniferous	260-300	Warm, becoming glacial
	Devonian	310-340	Moderate, becoming warm
	Silurian	340	Warm
	Ordovician	400	Moderate to warm

Cambrian	510	Cold, becoming warm
Pre-Cambrian	560	Glacial

Source: Ayoade (2003)

Climate change is different from the generally known term as climatic variability which means variation in the mean state and other statistics of climate on all spatial and temporal scales beyond that of individual weather event. Such temporal scale variations could be monthly, seasonal, annual, decadal, periodic, quasi-periodic or non-periodic. Climate change is of two facets namely global warming and global cooling. Global warming is a gradual but systematic increase in average global temperatures experienced for a very long period of time while the reverse is true for global cooling. The ongoing global warming has taken about four decades without reversing. IPCC (2007) shows that the current warming of the earth's climate is unequivocal caused by anthropogenic forces as is now evident from observations of increases in global average air and ocean temperatures. If the current warming continues unabated for a prolong period, it will attain a new climatic status – warm or hot climate – with its effects on man and the ecosystem.

The key to understanding global climate change is to first understand what global climate system is, and how it operates. At the planetary scale, the global climate is regulated by how much energy the Earth receives from the Sun. However, the global climate is also affected by other flows of energy which take place within the climate system itself (Fig. 1a). This global climate system is made up of the atmosphere, the oceans, the ice sheets (cryosphere), living organisms (biosphere) and the soils, sediments and rocks (geosphere), which all affect, to a greater or less extent, the movement of heat around the Earth's surface. The atmosphere however, does not operate as an isolated system. Flows of energy take place between the atmosphere and the other parts of the climate system, most significantly the world's oceans. The significance of the oceans is that they store a much greater quantity of heat than the atmosphere. The top 200 metres of the world's oceans store 30 times as much heat as the atmosphere. Therefore, flows of energy between the oceans and the atmosphere can have dramatic effects on the global climate.

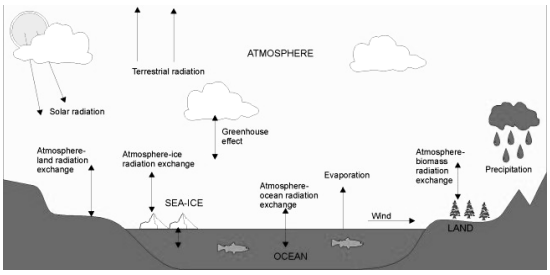


Fig 1a: The Earth's climate system responds to changes not just in the atmosphere but also the oceans and the ice sheets, and over longer periods of time, movements of the Earth's crust and even the evolution of life itself.

A drastic change in the climate systems either due to natural forces or unsustainable human activities results in climate change. The latter is regarded as the basic cause of on-going climate change and the advanced countries are most responsible (DeWeerdt, 2007). IPCC (2007) shows that observed climatic data from developed countries reveal significant change in many physical and biological systems in response to global warming but there is remarkable lack of geographic balance in data and literature on observed changes with marked scarcity in developing countries. It is on this premise that this paper is structured to assess the causes, rate and effects of **c**limate change and global warming with emphasis on Nigeria.

Conclusion

The paper shows that climate change is caused by both anthropogenic and natural factors. What we are experiencing now is global warming caused by anthropogenic factor (human activities) and when the on-going warming continue unabated for decades or centuries with significant ecological impacts then, the earth will

attain a changed climate (warm or hot climate). The human activities that cause global warming are transportation, industrialization, urbanization, agriculture, deforestation, water pollution and burning of fossil fuel among others. These either emit greenhouse gases into the atmosphere or reduce the rate of carbon sinks. The implication is that global warming is being experienced with global temperatures rising by $0.74^{O}C$ since 1860 while that of Nigeria increased by $1.79^{O}C$ and rainfall decreased by 91 mm within the two climatic periods.

The impacts of climate change are global but it will hit harder on developing countries because of their poor status and low adaptive capacity. To reverse the impacts, appropriate measures are needed to reduce the rate of greenhouse gases emissions while adequate adaptation and mitigation strategies should be applied. To do this, efficient and effective energy supply based on solar, wind, geothermal and bio-energy should be encouraged. Fuel efficient vehicles and aircrafts alongside mass transportation and non-motorised means of transport are needed. While deforestation should be reduced, afforestation and forest management should be encouraged.

Advanced countries like the U.S.A, Canada, United Kingdom and Japan etc, have been putting things in place both to reduce the emission of GHGs and mitigate the effects of climate change but there is no evidence that Nigeria has started anything with respect to emission reduction and preparedness for mitigation measures. We hope that the bill on climate change and the recommendation to establish climate change commission will have appropriate political backing to start GHGs emission cut and mitigation measures against climate change in Nigeria.

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WATER POLLUTION IN NIGERIA COASTAL AREAS: CHALLENGES OF PRESENT LEGAL MECHANISM AND RECOMMENDATIONS FOR AMENDMENT

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Abstract
The environment bestowed to man is clean and safe for all mankind. In a bid however to develop and achieve set objectives especially social and economic objectives has found different ways to subdue the environment. This crave for development has brought about deleterious consequences to the environment due to unsustainable practices by both developed and developing countries. The discovery of oil in the Niger Delta since 1956 at Oloibiri has witnessed a gradual degradation of the environment through activities associated with oil exploration, of which oil spillage is a major ill. This has been often due to pipeline corrosion, sabotage, inadequate care in loading and offloading oil vessels etc. In a bid to prevent, control and reduce the incidence of oil pollution, different laws have been enacted by the federal Government and many international conventions have been ratified and domesticated to address this issue. This study was therefore used to look into some existing legal mechanisms aimed at preventing and controlling the menace of oil pollution in Nigeria and critically appraised the level of enforcement and compliance to these laws. The outcome showed that some shortcomings exist in both the laws and enforcement mechanisms and these became loopholes for operators to perpetrate unsafe practices. Suggestions which could aid legal measures to amend or repeal outdated laws that are not in tandem with present day realities of the environment were then proposed in order to achieve sustainable practices in the oil production.
Key words: Oil spillage, Niger Delta, Laws, Regulation and Control, Nigeria

Introduction

Nigeria is bordered to the North by the Republic of Niger and Chad, to the West by the Republic of Benin, to the East by the Republic of Cameroon and to the South by the Atlantic Ocean. She has a coastline of approximately 853km facing the Atlantic Ocean, the terrestrial portion of the Atlantic coastline lies about 28,000 km^2 in area while the surface area of the continental shelf is 46,300km. The coastal area of Nigeria is low lying with heights of not more than 3.0 m above sea level and is generally covered by fresh water, swamp, lagoon marshes, tidal channels, beach ridges and sand bars. States in the coastline are Abia, Akwa Ibom, Bayelsa, Cross River, Delta, Edo, Imo, Lagos, Ondo and Rivers States. Within the national coastal areas, a wide range of human activities are carried out, with such activities ranging from industrial, tourism, ports and shipping, agriculture, fishing, communication, boats and ship building to oil and gas exploration amongst others (Dublin- Green et.al., 1999; Nwilo and Badejo 2006).

Section 20 of the 1999 Constitution of the Federal Republic of Nigeria provide for Environmental objective which stipulate “the state shall protect and improve the environment and safeguard the water, air, land and all plants and humans or animals living therein and the inter-relationships which exist among these or any of them”. The environment in this context is the totality of the physical, economical, cultural, aesthetic and social circumstances which surround and affect the desirability and value of the environment (Ebeku, 1998). Though the constitution provide for the protection of the environment in its totality, some instances arise when the level of interaction between man and the environment are a subject of concern, most especially when consideration is placed on the balance of constituted laws and regulatory authorities to enforce and forestall substandard practices. The desire and spirit of the constitution while addressing the issues of pollution is aimed at providing a basis for adjudication when matters relating to water, air and land contaminations arise, either deliberately or by negligence. Moreover, Section 38 of the Federal Environmental Protection Act define pollution as manmade or anthropogenic alteration of chemical, physical or biological quality of the environment to the extent that is detrimental to that environment or beyond acceptable limits. In view of this definition, water pollution can be

defined as the contamination of streams, lakes, underground water, bays or oceans by substances harmful to living things. It makes streams, lakes and coastal water unsuitable for any legitimate purpose of drinking, swimming, fishing etc.

Sources of water pollution have been found to vary from point sources to non-point sources. Point sources refer to specific, identifiable localized sources, such as sewage treatment plants, industrial plants that directly discharge materials into water, etc. while non-point sources refer to the sources which often times are from the use of pesticides and fertilizers in farm lands that gets washed into water bodies (Pierce et al., 1998). The scope of this study is limited to point sources of pollution which include spillage as a result of oil exploration and also processing and distribution of petroleum products. Water pollution as a result of oil spillage has started since the discovery of crude oil in the Niger Delta area in 1956 in the present day Bayelsa State. It has contributed in no small measure to the pollution of coastal waters in and around the Niger Delta area and the spread has gone to other coastal states. Such activities resulting from exploration and processing of crude oil and distribution of finished petroleum products, coupled with improper handling and lack of maintenance of equipments have resulted in grave consequences on the environment especially the surrounding water bodies. However, pollution emanating from oil production processes is mostly due to accidental discharges or leakages due to faulty, rusty or ill maintained equipments, oil pipeline vandalization, engineering drills, inability to effectively control oil wells, failure of machines, and inadequate care in loading and unloading oil vessels, to mention a few (Nwilo and Badejo, 2006).

Conclusion

The challenges of oil pollution in the Nigeria coastal areas dates back to the 1950s and the effects of these oil spillage and leakages are now coming to the fore. It behooves the Federal and State Governments, agencies and operators in the petroleum industry to collectively fight the menace of oil pollution in the coastal areas. Failure to arrest the situation will only bring more economic, political and social tensions in the polity. The spillage of oil and its attendant effects portend grave damage to the ecosystem of the area which cumulatively affects the quality of life of the people living in the area. Various regulations and legislations have been enacted and some international conventions ratified in a bid to prevent, control and reduce the incidence of oil pollution in Nigeria. These laws and regulations were examined in accordance with present day situations in this study and some shortcomings were observed. More so, the enforcement mechanisms that have been put in place have not been very effective in the duties of checking and enforcing good practices that goes with recognizable international and national standards. The penalties for flouting the laws have also not been adequate at compelling operators to adhere strictly to rules of good practices. It was therefore proposed among other suggestions that stiffer penalties should be meted on polluters of the environment and also that a general review of the laws and regulations guiding the operations of the oil industry would be extremely important to meet present day realities.

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INCENTIVISING PROCESS INNOVATION IN CONSTRUCTION SUPPLY CHAIN: THE FORMAL COMMUNICATION STRUCTURE

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The UK construction and building services sector is under pressure to engender the culture of innovation and incentivisation as normal working practice in the delivery of 'flexible' and 'complex' infrastructures. The research aims to understand the role of contracts in the incentivisation of performance and particularly the diffusion of innovation in construction supply chains, which is not well understood. Adopting an exploratory, multi-method case study of an NHS-procured hospital; the contract structure, communication network and organisation analysis frameworks are used to explore the extent to which tendering and contractual provision provide the space and freedom that encourages or hinders the emergence, communication and implementation of innovative products and practices. The main findings demonstrate the innovative role of the specialist contractor; identifies the limitations of the formal structure; and emphasizes the role of power in the incentivisation of informal communication in the effectiveness and the diffusion of process innovation.

Keywords: communication network, contract, incentivisation, construction supply chain, innovation

INTRODUCTION: A HEALTHCARE DELIVERY PERSPECTIVE

The significance of UK's National Health Service (NHS) cannot be overemphasized. The NHS aims to provide healthcare for all, free at the point of need. Proposed investments within NHS estates in the UK are in excess of £70 billion (NHS 1999). The impact of frequent changes in policies and healthcare technologies on the adaptability and performance of these infrastructures cannot be overemphasized (Barlow and Koberle-Gaiser 2008). The Private Finance Initiative (PFI) which is one of the preferred procurement models of the NHS since the late 1990s have been under scrutiny, but the question being asked in recent times is whether the PFI procurement model has delivered on its promises[2]? Evidence from the literature suggests that there is a divided consensus on the potential role of PFI to enable effective diffusion of innovation (Carrillo *et al*. 2006, Ball *et al*. 2001). Further, there is an inherent conflict among construction and building services actors about what adaptability and innovation means to the delivery supply chain. Barlow and Koberle-Gaiser (2008) investigated the relationship between PFI and innovation in the design of healthcare infrastructure to enable future adaptability but did not recognize that lessons too can be learnt from the interplay between the formal and informal communications within PFI and non-PFI procurement models in recommending a shift towards 'smart PFI'.

The intangibility of innovation makes drafting contract clauses to encourage innovation/ incentivise innovation and creativity very difficult. Furthermore, it is not clear whether incentivisation could be passed through the supply chain without compromising the position (in terms of benefit) of the most important players in the procurement process. Thus, the focus of this research is to understand the relative contractual provision within construction

[2] Inject innovation into the healthcare sector; contractual arrangements that would ensure better facilities management; means of renewing NHS facilities faster (Barlow and Koberle-Gaiser 2008).

procurement models that incentivise innovative practices and its diffusion in construction supply chains. In other words, to what extent does tendering and contractual provision provide the space and freedom that allows organizations to encourage or hinder the emergence, communication and implementation of innovative design products and services? Contract interfaces in the construction supply chain will be explored to examine how construction clients, contractors, designers, manufacturers and suppliers are motivated to improve the performance of products and services they procure and provide. The evidence to be collected will be on incentives, creativity, organisational behavior in the context of behavioural economics and the interrelationship (formal and informal) between network actors within and across organizations.

1.0 CONCLUSION

Process and technological innovations are associated with operational roles and activities. The need to capture what this means in the language of construction industry actors cannot be overemphasized, particularly when the role of contract in the incentivisation of innovative practices in construction supply chain is not well understood. Drawing on an exploratory, multi-method case study of an NHS procured hospital there are sufficient evidence to contend that client's perception of what innovation means – innovation as a replication and not as an invention - is skewed. The client's power to drive innovative practices down the supply chain is diluted. Interestingly, the specialist contractor is seen to be exhibiting innovative practices that should be incentivised at all phases of any procurement model. In other words, management and strategic thinking are heavily linked to control roles and activities. Actors are able to wield power in order to influence information flow within and across boundaries. Consequently, the link between its effectiveness and the diffusion of process innovation can be sustained by incentivising the institutionalization of informal communication networks. This includes a loosely coupled organisation, a client that is able to distinguish between replication and invention, a client that wields power past the first tier of the construction supply chain, a contract structure that integrates the pursuit of a common goal (supply chain) and a client that is prepared to understand the organisational structure and imbibe the innovative practices of the specialist contractor. The issue of generalizability, which was considered as a limitation, was addressed using content analysis; and the number of open, unstructured interviews is determined by the research strategy – this is an exploratory, multi-method case study of an NHS-procured hospital. More importantly, the contribution to practice will enable providers of health care to motivate those who deliver infrastructure by establishing reward systems that motivate and reward them to think about the impact of each part of the process on the effective delivery of health care. At a regional level, this would enable integrated purchasing departments to develop clear practical solutions to the development of their specific supply chain partners. At a national level, guidance and policy can be provided about how the procurement of infrastructure should be arranged, and at the international level, general policy guidelines can be published that place the UK at the forefront of policy developments in this arena.

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CLIMATIC CHANGE: IMPLICATIONS FOR ANIMAL AND HUMAN PARASITIC INFECTIONS IN NIGERIA

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Summary

Nigeria with her demographic, geographic and infrastructural characteristics makes interesting study in the climate change phenomenon. Nigeria contributes to global warming through her significant oil exploratory activities among others. The Nigeria ecosystem is vulnerable to a number of climatic changes which have indirect implication on the prevalence of humans and animals parasitic infections. Climate change causes shifts in some conditions such as rise in sea level, incessant flood, drought, and rise in temperature. In response to shifts in the patterns of rainfall and temperature; mosquitoes and other vectors such as tsetsefly, blackfly, currently thrive in locations where water logging and poor drainage typify the landscape. High flood frequency and water-logging due to climate change in ecozones hitherto unassociated with malaria would enhance the breeding of mosquitoes and thus the spread of malaria. Malaria would increase due to the preponderance of stagnant pools of water resulting from sea-level-rise-related flooding. Drought in northern Nigeria would reduce the rate of mosquito breeding, which would be precursory to low prevalence of malaria, consequently leading to decreased immunity to malaria. Subsequent onset of rainfall, characterized with flooding enhances the prevalence of malaria which has a debilitating effect on the "low-immunity" population. The rise in temperature due to climatic changes favours the breeding of vectors of parasitic infections. Discomfort due to elevated temperature would cause people sleep outside of their houses at night, while others would expose their body in a bid to cushion the effect, thereby exposing their bodies to infective bites of vectors. Migratory birds guided by climatic changes are suspected risk factors to human and zoonotic parasitic infections in Nigeria. Although non-climatic factors including socio-economic development, immunity/drug resistance play important roles in the epidemiology of parasitic infections, the link between climate change and the latter is incontrovertible.

Key words: Climate change, parasitic infections, vectors, epidemiology, Nigeria

INTRODUCTION

One of the environmental threats our planet faces today is the potential for long-term changes in the Earth's climate and temperature patterns known as global climate change. Scientists estimate that as a result of global climate change, the Earth's average temperature could increase as much as six and one-half degrees Fahrenheit by the year 2100 (NCAE, 1998).

Climate change is a change in the statistical distribution of weather over periods of time that range from decades to millions of years. Climate change may be limited to a specific region, or may occur across the whole Earth. It can be caused by recurring, often cyclical climate patterns such as El Niño-Southern Oscillation, or come in the form of more singular events such as the Dust Bowl (http://en.wikipedia.org/wiki/Climate_change). Actions of man have impacted the earth and its climate in significant ways. One of such significant anthropogenic activities is the burning of "fossil fuels" such as coal, oil and gas, which results in the release of carbon dioxide. The amount of carbon dioxide in the earth's atmosphere has increased by nearly 30%, since 1800s when burning of large quantities of coal and oil commenced and average global temperature appears to have risen between 1° and 2°F (http://www.gcrio.org/gwcc/part1.html).

Carbon dioxide gas traps solar heat in the atmosphere, partly in the same way as glass traps solar heat in a sunroom or a greenhouse. For this reason, carbon dioxide is sometimes called a "greenhouse gas." As more carbon dioxide is added to the atmosphere, solar heat has more trouble getting out. The result is that, if everything else stayed unchanged, the average temperature of the atmosphere would increase. As people burn

more fossil fuel for energy they add more carbon dioxide to the atmosphere. If this goes on long enough, the average temperature of the atmosphere will almost certainly rise (http://www.gcrio.org/gwcc/part1.html).
If global warming occurs, not every day or every place will be warmer. But on average most places will be warmer. This will cause changes in the amount and pattern of rain and snow, length of growing seasons, frequency and severity of storms because an increase in global temperatures will lead to an intensification of the hydrological cycle. This is because an increase in surface air temperature causes an increase in evaporation and generally higher levels of water vapor in the atmosphere. In addition, a warmer atmosphere is capable of holding more water vapor. The excess water vapor will in turn lead to more frequent heavy precipitation when atmospheric instability is sufficient to trigger precipitation events. Intense precipitation can result in flooding, soil erosion, landslides, rise in sea level and damage to structures and crops. Farms, forests, and plants and animals in the natural environment, will all be affected.
Coal and oil also contain sulfur, and when they are burnt, the sulfur is transformed into fine particles in the atmosphere. Most scientists think that sulfur particles cool the planet. In the northern hemisphere, this cooling has partly canceled some of the warming that should have come from the growing concentrations of greenhouse gases. However, since emissions of greenhouse gases continue to grow, and most countries are working hard to reduce emissions of sulfur air pollution, this canceling will probably not continue in the future. In that case, the average temperature may rise more rapidly (http://www.gcrio.org/gwcc/part1.html). Human emissions of methane and nitrous oxide together contribute almost half as much warming.

Climate change and human settlement in Nigeria

Urban and rural population concentrations will be disrupted, particularly along the coastline due to sea-level rise and related phenomena. Some settlements are known to have already relocated farther inland from their original sites in response to sea incursion over some decades. Population displacement and migration from, and to, various human settlements will arise from either or both of drought incidence in the Northern states of the country and accelerated sea level rise in the coastal regions. Rises in sea-level will also threaten urban and rural infrastructure facilities in low lying coastal regions (http://www.nigeriaclimatechange.org/).
The impact of climate change can be vast. In Nigeria, this means that some stable ecosystems such as the Sahel Savanna may become vulnerable because warming will reinforce existing patterns of water scarcity and increasing the risk of drought in Nigeria and indeed most countries in West Africa as well, the country's aquatic ecosystems, wetlands and other habitats will create overwhelming problems for an already impoverished populace.

Changes in weather and climate have been known to profoundly influence water resources, a factor that increases the vulnerability of humans to infection. Generally, water resources involve all forms of fresh water needed for life's necessities, ranging from domestic needs of drinking, washing and cleaning, to agricultural needs involving food processing and irrigation, to other general needs.
Fishing and fisheries are important occupation and operations that provide income, employment and proteins to Nigerians. In a situation of global warming of between 1.5 – 2OC, fisheries in Northern Nigeria, as in other northern parts of West Africa, would evidently be impacted (IPCC, 2007)
An article in a website (http://www.peoplesdaily-online.com) highlighted some outcomes associated with water bodies in different zones in as follows: (a) Reduced water volume in streams and rivers, arising from different scales of water diversion for rudimentary irrigation activities, siltation of stream beds due to deposition of materials by water run-off, as well as evapotranspiration; (b) Drying up of water sources due to increased evapotranspiration, and loss of vegetation in head waters (c) Deficiencies in freshwater availability which will worsen the already poor sanitary and health conditions in these areas; uncontrolled disposal of wastewater and human wastes resulting in deterioration in water quality. This leads to high organic levels in surface and ground water thereby increasing epidemics of water-borne diseases such as cholera, hepatitis, typhoid, malaria and filariasis. (d) Reduced stream velocity due to loss of gradient from siltation; Rapid rate of siltation of river/stream beds due to transport, and deposition of eroded materials from heavy rainfall-induced flooding, etc. (e) Pests and diseases which are affected by climatic conditions such as temperature, precipitation, sunshine and wind. Pests and diseases can adversely affect food crops, animal husbandry; it also

causes human suffering (for example, malaria, cholera, and typhoid and dengue fever) which in turn affects the effectiveness and productivity of Nigeria's labour force.

Climate change causes changes in the migratory, reproductive phenology (advancement in breeding and migration dates), abundance, population dynamics, and northward expansion of the geographical range of several bird species (Parmesan and Yohe, 2003). Possible consequences of these phenological changes in birds to the dispersion of pathogens and their vectors include shifts in geographical distribution of vectors and pathogens due to altered distributions or changed migratory patterns of bird populations; and changes in the life cycles of bird-associated pathogens due to the mistiming between bird breeding and the breeding of vectors, such as mosquitoes. One example is the transmission of St. Louis encephalitis virus, which depends on meteorological triggers (e.g., precipitation) to bring the pathogen, vector and host (nestlings) cycles into synchrony, allowing an overlap that initiates and facilitates the cycling necessary for virus amplification between mosquitoes and wild birds (Day, 2001).

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NIGERIA'S ENERGY POLICY AND VISION 20:2020: ISSUES OF WIND AND OTHER RENEWABLE ENERGY TECHNOLOGIES

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Abstract
The study was used to assess and analyze the policy issues of Nigeria energy production and distribution in line with the current vision 20:2020 of the federal government with particular focus given to the development of wind and other renewable energy technologies. Initiatives of the government at ridding the nation out of her energy poverty and the proposals of the renewable energy master plan were surveyed. It found that, the proposed renewable electricity generation plan represent an underestimation of the renewable energy resources' potential of the nation and also the projected electricity demand supply plan was inadequate going by today's reality of population and 13% gross domestic growth rate of vision 20:2020. Indices which represent greater opportunities for production of renewable electricity were identified and discussed. The outcome showed that although Nigeria has potentials to employ renewable energy resources of wind, solar and biomass as well as available small hydropower potentials to produce electricity, the identified challenges hindering the development of these resources must be overcome and the proposed strategies and suggestions employed for the nation to be on her way to stronger sustainable development and adequate energy development.
Key words: Energy policy, Power generation, Renewable resources, Nigeria

1.0 Introduction

Nigeria is a country whose energy need is nourished by supplies from different hydropower stations and few thermal gas power stations within her. The hydropower stations take advantage of the topography of Niger and Benue Rivers and other water masses in other places within the country, representing huge prospect for meeting the energy needs of the nation through production of clean electricity. The country on the other hand, is endowed with rich energy resource base, having the ninth largest natural gas reserves in the world and associated to non-associated natural gas deposits in the ratio 53.5:46.5 (Ajayi and Ajanaku, 2009). Through this, she drives the various thermal power stations located within the southern parts of the country. However, her changing seasons between wet and dry makes the extent of water availability at the different power stations variable, leading to intermittent supply at times of low water levels, also according to a report, only 20% of the nation's hydro-power potential is tapped for use (ECN – UNDP, 2005) and the available thermal power stations in their installed capacity cannot produce sufficient amount of energy for the populace. These challenging power production situation coupled with the present and even increasing population side by side the total capacity of available power stations have placed the nation in a real situation of not being able to meet the energy need of the people (Olayande and Yusuf, 2003). This shortage in energy supply has prompted many of the industries to rely on alternative sources of diesel and petrol generators to keep their businesses running. However, a lack of energy in an economy or its inadequacy had led to social and economic poverty, underdevelopment, unemployment, underutilization of rural human resources, economic stagnation, underperformance of industries and industrial sectors, low turnover, high level of illiteracy and increased migration. More so, the various women right programmes, literacy programmes, birth control policies and the millennium development goals programmes will not do well if the current trend of energy shortages experienced in the country is not addressed adequately (Hermann, 2001). Citizens located in the rural areas still depend on traditional biomass for cooking and heating, increasing environmental pollution, because, their communities are not connected to the national grid. In 2003, the electricity availability per Nigerian derived from the ratio of total generation to population is estimated to be 127.0 kWh per person (EIA, 2003, 2008). This is very minimal when the data is compared to those of Ghana (255.8 kWh per person), Italy (4,654.5 kWh per

person), United Arab Emirate (11, 045.58 kWh per person), Egypt (1,127.6 kWh per person), Algeria (850.7 kWh per person) and South Africa (4,853.9 kWh per person) for the same reference year 2003 (EIA, 2003, 2008). Further comparing this amount of electricity made available to each Nigerian (127.0 kWh per person) by the federal utility to the total consumed in year 2003, revealed that only 0.72% of the energy consumed per person was provided by the federal utility, pointing to the fact that alternative energy sources of fossil fuel burning and biomass burning in the form of fuelwood have formed the main stay of Nigeria's economy. The effluents from these sources are subjects of several international debates on climate change and global warming.

Furthermore, comparing the trend of energy consumption per person for different years (Fig. 1) also reveal striking inferences. Fig. 1 clearly demonstrate that the energy consumption of Nigerians have been declining at a rapid rate. The reason may be partly due to the crises in the Niger Delta, the rising pump prices of fossil fuels, the inconsistency in power supply from the national power utility and the high loses in electricity transmission.

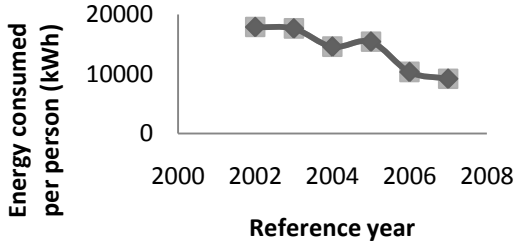


Fig. 1: Energy consumed per person per reference year (Ohunakin, 2010)

Moreover, considering the prevailing sources of energy production revealed that production is wholy based on two major sources of hydro and thermal. While these sources are capable of producing enormous energy, sole dependence on them have led to insufficient power production. This is because of the seasonal dependence of hydropower and the rising cost of natural gas and other fossil fuels. The majority of the power stations are operating below installed capacity. Nigeria power sector for example, operates below its estimated capacity. In 2004, total installed electricity capacity was 5900 MW, but, total production during the year was put at 2169MW (or 19 TWh) and the amount consumed was 2055 MW (or 18 TWh), with only 40% Nigerians, mostly urban dwellers having access to it (EIA, 2007; Ajayi and Ajanaku, 2009). In 2008, the difference between installed capacity and production capacity amounted to 40.8% losses, with electricity penetration rate in Nigeria put at around 50 – 60% of total population (EIA, 2007; UNDP-WHO, 2009). As at 2001, about 25% of the 774 local government areas of Nigeria were not connected to the national grid and today, more than 75% of these areas are still not connected. Worst still is the reports on Nigeria showing discernable evidence of climate shifts and suggesting tendency towards climate change. According to Obioh and Fagbenle (2009), it was initially established that most parts of Nigeria had what could be termed normal or above normal onset of rainfall dates during the mid-20th century (1941-1970) except for Sokoto, Calabar and environs where rains were usually late. Then as the century progresses (1971-2000), late onset of rains spread to more areas with only a narrow band in the middle belt and southwest regions remaining normal. In consequence, Annual rainfall amounts in most parts of the country showed a decrease of two to eight mm/year with only few places (Lokoja, Kano, Ibadan and Ondo) showing an increase ranging from two to four mm/year of rainfall for the period 1941-2000. Much more significant decreases were observed in Port Harcourt (on the coast) and Katsina (on the arid and semi arid zones of the north). The outcome of this is in the fact that, hydroelectricity generation might suffer some setbacks in the future if quick attention is not focused on sustaining its continuous production. Be it as it may, the challenge grows daily and the need to produce sufficient amount of energy heightens. With the total amount of energy produced run into the national grid, the rural dwellers still stand only in hope of future brighter life, as the majority of the rural and sub-rural places are not linked to the grid. This therefore means, the country need to look for alternative sources of energy to meet her growing energy demand.

The realization of the need to have adequate energy development programme for power generation in the country over these few years had prompted some government initiatives. Based on this, the government recently has been making frantic efforts at seeing the energy state of Nigeria improve beyond the present level

and thereby committing great resources to develop modules and increase generating capacities. A landmark achievement by the government is the development of the national energy policy and the energy statement of vision 20:2020. This paper is therefore used to critically analyze the policy issues of energy development in Nigeria giving particular focus to the development of alternative energy sources. It surveys the various initiatives of government at improving the nation's energy supply and identifies the challenges which the development of alternative sources of energies has over the years gone through. It also proposed some strategies which can help improve the development of renewable sources of energy and also discussed some suggestions that could alleviate the problem of energy scarcity.

Conclusion

This study has been used to discuss the issues generated in the Nigeria's national energy policy and the energy statement of vision 20:2020 of the federal government with particular focus given to wind and other renewable energy resources and technologies. It surveyed the nation's energy policy statement and the energy statement of vision 20:2020 as well as the Renewable Energy Master Plan (REMP) developed by the joint collaborative effort of Energy Commission of Nigeria and United Nations Development Programme. The energy intentions of the government as contained in the policy and vision 20:2020 documents were analyzed in comparison with today's reality. The outcome showed that although the energy policy and vision 20:2020 were well laid out, it however contain some pointers to challenging future if more efforts are not jeered towards adequate energy production. Also, the energy demand and supply projections as contained in REMP document were outside the present day reality and the proposed RE plan represents and underestimation of the resources' potential available in the country. Some challenges hindering rapid development of renewable energy resources for power generation were identified. These challenges include economic barriers, low electricity tariff, nonexistent legal, institutional and regulatory framework, poor government motivation, insufficient resource assessment, and non existing resource map to mention a few. Some suggestions which could help pull the nation out of her energy poverty were also raised and discussed. This include focus of government on quality proposals of the energy policy and renewable energy master plan that meets today's reality, provision of funds to aid RET research and development, collaboration between governments at all levels with private sectors to forward the national development of renewable energy resources and introduction of subsidies on purchases of RETs to mention a few. .

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A NEW APPROACH TO SUSTAINABLE TRANSPORT SYSTEM: A CRITICAL APPRAISAL OF THE RAPID BUS TRANSIT SYSTEM (BRT) IN SOUTH AFRICA.

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ABSTRACT
Public transport should be considered in the urban context as a good supportive infrastructure for public space. This can be considered based on the World Bank report of 1986 which considered public transport as the most efficient means of moving large numbers of people, especially in dense areas. Bus services; in particular provide considerable flexibility in meeting demands for transport at various levels of quality and quantity. One of the legacies of apartheid is the lack of connectivity between the so called "Townships" and the "Suburbs". Most residents commuting from the township to the city not only spend a huge amount of money to and from work. This impact greatly on their productivity as they get tired by the time they get to their places of work. To combat congestion and provide better public transport in the face of this concern the City of Johannesburg, Cape Town, Tshwane and Nelson Mandela Metro introduced the Rea Vaya BRT (Rapid Bus Transit system). This is a public transport infrastructure that is being used in developing countries with similar history like South Africa. The buses will run in exclusive, dedicated lanes in the centre of existing roads. Smaller feeder buses will bring people from the outer areas to the station on the trunk routes. The buses are of 75 or 112 capacity depending on passenger volumes and will operate in about 150 stations positioned half a kilometer apart to run every three minutes in peak times and every 10 minutes in off peak times from 5am to 12 midnight. Since the commencement of this public transport system the operators has witnessed stiff resistance and violent crashes with existing taxi operators. In this study we look at the viability of the BRT in terms of obtain a buy-in from existing operators. The research will question the sustainability of this rapid bus transport system in relation to Security, Affordability and travel time saving. The use of South Africa in this study is because this is the first time the Department of Transport is rolling out this system of Integrated Transport Plan which is backed with Strategic Public Transport Network.

Key Words: Public Transport, BRT, Integrated Sustainable Transport Plan and South Africa.

INTRODUCTION

Transport is a derived demand (Cervero, 2003, World Bank, 2008). It is not normally an end in itself but a means to more end(s). The end that it supports is the provision of access to activities of all kinds. The concern is whether or not people can access key services at reasonable costs, in reasonable time and within reasonable ease (Chakwizea, 2009: 117). In 1986 the World Bank report on public transport policy proposed public transport as the most efficient means of moving large numbers of people, especially in dense areas. Bus services, in particular, provide considerable flexibility in meeting demands for transport at various levels of quality and quantity. In South Africa the provision of public transport has been characterized to serve the few. A large percentage of commuters use private vehicles. In the large metropolitan cities, the modal split is

generally 50% private to 50% public transport going into the CBD. Generally the private commuters are single occupancy vehicle which leads to increased congestion and inefficient fuel consumption with associated high levels of carbon emissions. Makeke (2009:77) noted alarmingly in his research that transport sector is responsible for 25% of carbon emission in South African cities. This has serious implication on the Urban envelope and environment. Available public transport services differ across cities, in most cities there are bus and minibus taxi systems, with rail found in the main metropolitan cities, but not in the smaller cities. City bus and train systems provide the most efficient form of transport in terms of energy per commuter kilometer, however, even though these are by and large the same price or cheaper than minibus taxis, they are underutilized. This is due to the following reasons: inconvenience, Bus and train system do not service many informal settlements and are often not well linked in to an efficient

network of transport system; unreliable reputation; perception that they are slower than taxis; safety concern, particularly on train; and express the need for large scale infrastructure to improve the current public transport system in order for it to improve its current share of commuters. South Africa spatial planning fragmentation challenge can be traced to the previous government spatial segregation policies which has an outcome of today settlement challenge that exhibit far reaching social transport ramifications such as; low-income settlements are located far way from areas of socio-economic opportunities such as industries and commercial centres; low income earners travel to work and socio-economic facilities takes approximately 65 minutes on average (DOT, 2003). Low income earners spend well over 10% of personal income on transport which is above the stipulated percentage contained the government white paper on transportation (Mokonyama et al, 2007); Low income residents have less family and bonding time with children. The bulk of their energy is consumed day walking or waiting for public transport. The high risk associated with this, especially with regard to safety is enormous. One of the biggest challenges facing South Africa's transport authority is traffic safety. The Country rank very high on accident fatality rates, with approximately 498,000 traffic accident, 46000 serious injuries, and 3000 traffic fatalities annually of which around 5,300 are pedestrians (RMT, 2008).

CONCLUSION AND RECOMMENDATION

The BRT (Rea Vaya) has revolutionalised transport cost through low public transport cost "enhancing transit oriented development". Reduced travel times as household get round the city within ample time with less fossil fuel consumption resulting to densification. Extended hours of operation is now making the city "a city that never sleeps" and has now become a location for inter-social encounters. High frequency along trunk corridors thereby improving public engagement and security Full access for passengers with special needs – According to one Paraplegic Sibongile Msibi he noted "Our treatment from taxi drivers is shocking. We are always left behind, and are told that we are a waste of their time" (Alex News. 2009:3). Integrated fare structure through common fare system on all modes on the network is one unique attribute that observers have noted that distinguish Rea Vaya from existing taxi commuters. There is some challenges that cannot be swept under the carpet as it relates to increase in commercial market value of prime property that has now benefited from BRT access, loss of public space which has made the remaining public space less secured and persistent resistance from existing taxi operators who have felt stiff competition from their previous oligarchic structure. As the debate on the sustainability of public transport can never have one size fit all solution there is need for scholars to intensify research in associated areas like: There is need for further research on gender-specific information on the target or beneficiary population to assess socio-economic benefits of roads and access to services. Household perception of their access to resources, services, opportunities, transport constraints and needs, priority problems can also be investigated. Cost- benefit analysis of the economic impact of transport cost on household income should form another area of interest.

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EVALUATION OF THE IMPACT OF PUBLIC HOUSING PROGRAMMES ON SUSTAINABLE DEVELOPMENT IN NIGERIA: A THEORETICAL AND CONCEPTUAL APPROACH

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Abstract
The aim of this paper is to develop a theoretical and conceptual framework for the evaluation of impacts of public housing programmes on sustainable development in Nigeria. It seeks to address the challenge of adoption of inappropriate tools in evaluation research on public housing provisioning .The paper argues that for adequate knowledge of the impact of public housing on sustainable development, a broad-based framework that transcends boundaries of many disciples should be engaged in the evaluation process. Therefore the proposed framework draws on a holistic and realistic approach to evaluation based on objective-oriented theory; theory-driven evaluation paradigm and a number of conceptual issues that allow for the assessment of relationships between input, output, outcomes and impacts, as well as sustainability of benefits of public housing programmes. The distinct features of this framework include: an open-ended evaluation approach; the use of survey tools in capacity and auditing of housing providers, household survey and environmental impact audit in assessing the impact and sustainability of public housing programmes.

Keywords: Evaluation, Public Housing Programmes, Impact, Sustainable Development

Introduction

Housing is the second most essential human need after food. It is an integral part of human settlement that has a profound impact on the quality of life, health, welfare, productivity of man as well as economic development and environmental sustainability. This implies that housing has multiplier effect on the human society and economic development. In spite of this essential nature of housing, a large proportion of the population in most developing countries does not have access to decent housing at affordable cost (Rondinelli, 1990; Tipple, 1994; Ajanlekoko, 2002; Sengupta and Sharma, 2008). As a result of this, inadequate housing condition constitutes an insurmountable challenge that has continued to receive attention from governments and individuals in most developing countries. As part of human tradition which seeks to investigate, describe, understand, proffer solutions and take actions to ameliorate defects in human conditions, and enhance individual and collective well-being; both public and private sectors have continued to take actions aimed at addressing social and economic challenges posed by inadequate provision of housing in most countries of the world. These actions are in the form of legislations, policies and strategies, which most often culminate in housing programmes. It is argued that the housing problem in developing countries in general and Nigeria in particular has been aggravated by inappropriate housing programmes. This is because public housing programmes should ideally be the principal source of decent and affordable housing to the majority of people who cannot afford housing provided by the commercial private sector (Mukhija, 2004). Although between 1960 and 1999 various administrations in Nigeria had embarked on a minimum of seven public housing programmes; but these programmes have failed in solving the problem of housing in the country. The burgeoning housing challenge is more in urban areas than in the country side due to rapid rates of urbanization and high level of

poverty which is hitting very hard on the low income earners. Similar studies have also observed severe shortage of housing units, overcrowding of existing ones and proliferation of slums and shanty developments lacking basic amenities (Corker et.al.; 2007; Aribigbola,2008) whereas in the rural areas most houses are poorly constructed, unsafe and without access to portable water supply and electricity (Onibokun (ed.),1985).Hence, the perennial problem of housing persists.

However, evidence in literature (Akinmoladun and Oluwoye, 2007; Ademiluyi and Raji, 2008) shows that governments are not relenting in their efforts at addressing the challenge of providing adequate, affordable and sustainable housing. This is probably in recognition of the fact that housing plays a key role in achieving sustainable development by the year 2015 and vision 2020. Achieving sustainable development through effective public housing provisioning entails judicious use of local quality resources, appropriate materials and technology in creating residential environment that has the potential of accelerating poverty reduction and maintaining ecological balance. This implies that cutting-edge knowledge and techniques be engaged in the design, implementation, monitoring and evaluation of housing programmes in Nigeria.

Howbeit**,** several research studies (Ali, 1996; Ukoha and Beamish, 1997; Ilesanmi, 2005; Olatubara and Fatoye, 2007; Fatoye and Odusami, 2009; Jiboye, 2009; 2010) had evaluated aspects of public housing programme in Nigeria, most specifically the level of housing and residential satisfaction. Regrettably, certain inadequacies which bear upon the focus and usefulness of findings of these studies for factual assessment of impacts of public housing programmes on sustainable development exist. Evidence in literature suggests that there is inadequate evaluation research on public housing programmes and that proper evaluation tools and frameworks are rarely engaged in monitoring and evaluating programmes in Nigeria. For instance, the 1991 Nigerian National Housing Policy (Federal Republic of Nigeria, 19991) noted that lack of adequate monitoring and evaluation of housing policy implementation had contributed to the failure of public housing programmes in this country. This was corroborated by Obashoro (2002) who observed that proper programme evaluation was rarely done in Nigeria, and as a result, it was very difficult to assess the real outcome of programmes in this country. The consequences of this are paucity of empirical data on the actual outcomes of housing programmes, and the use of inappropriate data, information and techniques in the design, planning and implementation of public housing programmes in this country.

Against this background, this paper argues that public housing programmes encompasses the provision of housing units and associated amenities as well as establishing appropriate framework for monitoring and evaluating the impact of such programmes on social, economic and environmental dimensions of sustainable development. Therefore, the aim of this paper is to develop a broad-based theoretical and conceptual framework for evaluating the impact of public housing programmes on sustainable development in Nigeria. The proposed framework lends itself to assessment of the relationship between the input, output, and impact of public housing programmes. It also allows for examination of the outcomes of different housing delivery strategies in public housing programmes as a means of generating vital input in housing policy formulation, programme design and implementation.

Conclusions

The aim of this paper is to present a theoretical and conceptual framework for evaluating the impact of public housing programmes on sustainable development in Nigeria. This paper proposed a new direction **on** evaluation research in public housing that goes beyond the traditional enquires on housing and residential satisfaction and the realm where one theory or discipline would have the upper hand in developing a comprehensive approach to evaluating public housing programmes. The proposed framework draws heavily on a new paradigm of research that crosses the boundaries of different disciplines and allows for investigation into the relationships between inputs, process, outputs and outcomes, as well as sustainability of gains of public housing programmes. Also in the research process, the framework links all aspects of the research including problem statement, aim, objectives, literature review, methodology, data collection and analysis as well as the interpretation of findings. This theoretical and conceptual framework although represents a structured method for investigating public housing programme, it is open and flexible for assessing the social, economic and environmental impact of public housing provisioning on sustainable development in Nigeria.

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EXPLORING THE POTENTIALS OF PAYMENT FOR ENVIRONMENTAL SERVICES IN THE CONTROL OF AGRICULTURAL LAND DEGRADATION IN NIGERIA

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Abstract:

Agriculture accounts for 25% of land use globally and since 1950, about two billion hectares of agricultural land is being degraded due to a number of natural and anthropogenic causes. Concerns about agricultural land degradation (ALD) have hitherto largely being focused on its effects on agricultural productivity while the effects on environmental quality have not received commensurate attention. Agricultural lands generate a number of vital ecosystem services and when degraded they create disservices with the attendant negative consequences on the environment and human well-being. Over the years, effective methods of controlling agricultural land degradation have been established. These include a number of best management practices, land improvement technologies and numerous other indigenous methods. Despite adequate knowledge of methods of controlling agricultural land degradation, the problem still persists largely because farmers are unable to implement them. Their constraints range from poverty, lack of investment, land tenure, among others. This paper explores the possibilities of using the payment for environmental services (PES) approach in combating ALD in Nigeria by suggesting some necessary steps before such a scheme could be entrenched in the country. The paper concludes that carefully designed PES schemes hold much promise in combating ALD in Nigeria. It is also suggested that Nigeria could finance its PES scheme through the ecological fund, fuel tax, grants from multilateral donors and budgetary provisions.

Key words: Agricultural land degradation, payment for environmental services, ecosystem services, environmental quality, best management practices.

Introduction:

Developing countries like Nigeria are facing the uphill task of meeting the millennium development goals (MDGs) before the year 2015. It is becoming increasingly clear that the first goal of halving the percentage of people in extreme poverty and the seventh goal of achieving environmental sustainability are unlikely to be met unless a sustainable solution for tackling environmental problems such as agricultural land degradation are found. With more than 70% of its 140 million population depending on subsistence agriculture, Nigeria will only guarantee food security and economic well being if its land resources, the base of agriculture, are protected from degradation or the quality of already degraded lands restored. Over the years, the problem of agricultural land degradation (ALD) is increasingly taking a worrying dimension due to a number of reasons.

Despite numerous attempts in tackling it, at various levels, the problem still persists even though most of the solutions are known. Lack of incentives to induce farmers to adopt good practices, failure to take a farmer perspective approach and the top down nature of interventions are believed to be some of the reasons why addressing the problem has been difficult.

Various approaches are being advocated in achieving sustainable development in the agricultural sector. One of such approaches requires a market that will recognize the value in environmental services (ES) generated by agricultural lands and a buyer is identified who can buy such services from the farmer who ensures that such services are generated or preserved. Experiences in many countries such as the United States, Costa Rica (Chomitz et al, 1998) and Nicaragua (Pagiola et al, 2007) have revealed the relevance of this approach in ensuring forest and biodiversity conservation through inducement of resource users to generate or protect vital ecosystem services through an approach called 'Payment for Environmental Services' (PES).

This paper explores the possibilities of using the PES approach in inducing farmers to adopt land improving technologies (LIT), adopt best management practices (bmps) or stop degrading activities. This is because a degraded land prevents agricultural systems from benefiting from or generating vital environmental services.

Conclusion:

Agriculture accounts for 25% of land use globally. It also benefits from and generates vital environmental services necessary for sustaining humankind and maintaining environmental quality. These ES include provision, regulating, supporting and cultural services. However, agricultural problems such as land degradation prevent agricultural systems from generating or benefiting from these ES. Degraded lands are also implicated in some cases for creating disservices with negative consequences to the environment and human well-being. A major environmental problem in Nigeria is agricultural land degradation where its effects are exacerbated by endemic poverty because majority of the people are subsistence farmers, who must use the land resources to 'eke out' a living. Unsustainable farming practices, climatic vagaries and policy inconsistencies are the principal reasons believed to be responsible for the problem. This situation continues to pose monumental challenge to achievement of the millennium development goals and related national development policies.

Considering the failure of past attempts to tackle the problem, this paper explores the possibilities of using PES to combat agricultural land degradation in Nigeria and suggests how such a scheme could be used. The money paid to the farmers under this scheme is expected to induce them to invest in land improving technologies, adopt best management practices or stop degrading activities which may lead to improvement of the quality of their lands. The improved family income from the scheme may also reduce rural poverty.

In order to use PES for this purpose, a number of methods are suggested. The incidence of land degradation can be established using simple field-level indicators, the causes of land degradation and the type of LIT and BMPs to promote under the scheme can be determined using sustainable livelihood and participatory rural appraisal techniques. Cost-benefit analysis would determine whether the investment would be worthwhile, economically. Finally contingent valuation method would be used to determine sellers' (farmers) willingness to accept to adopt LIT/BMP or stop degrading practices and buyers' (government or multilateral agencies) willingness to pay to drive the scheme.

PES holds much promise in combating ALD in Nigeria if carefully designed following the steps outlined above. The scheme could be financed through the ecological funds, introduction of fuel tax, outright budgetary provisions and leveraging funds from multilateral and bilateral donors.

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BUILDING LEADERSHIP CAPACITY FOR SUSTAINABLE GOVERNANCE IN NIGERIA:

LESSONS FROM ARCHITECTURAL DESIGN STUDIO CULTURE

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Abstract
The national policy on education in Nigeria has its cardinal objective to promote the acquisition of appropriate creative skills, abilities and competence both mental and physical as equipment for the individual to live in and contribute to the development of the society. In most recent times the Nigeria educational system and governance are both at cross-road by contrast to what are obtained in developed nations of the world. Predicated on this basis that, leadership potentials can be activated and built through a systematic-induction process inherent in architectural design studio culture model (learning-by-doing, LBDM), and capable of engendering sustainable development across all fields of human endeavour, including governance. It employed mainly a feedback-mechanism based on the design studio process instruction model. The study drew heavily on the ethical values of this model to justify its potentials in enhancing leadership capacity building in Nigeria. The results revealed the values of optimism, respect, sharing, engagement, and innovation while hinged on core factors of dynamism, teamwork, specification, creativity, intelligence and innovation that are at the heart of sustainable development.
Key words*:* Governance, Learning-by-doing (LBDM), Architectural design studio and Sustainable development

Introduction

Nigeria is still uncertain about the way out of prevailing educational and governance abyss. In other words, her destination is still unknown. The Nigerian citizenry had in recent times apportioned blame on the woes of Nigeria, and in particular that of the educational sector, to the many years of military rule. There is the common notion that the military neglected the universities because of their assumed opposition to military rule. But even with the re-emergence of civil rule the nation's educational institutions are still in shambles today, with university Teachers and other government public workers still not being paid on time. This act of misrule had rocked the societal boat by labor unrests prompted by nonpayment of salaries, students' riots, among other factors.

This study attempted drawing lessons from architectural design studio culture in order to achieve leadership capacity building for sustainable governance, with a view to: (i) bring out the ethical values at the nexus of architectural design studio and governance (ii) bring out the benefits that can be derived from the Learning- by -Doing (LBDM) instruction model that is capable of impacting on leadership and (iii) draw useful lessons from the architectural design studio culture of creativity to enhance leadership capacity building in Nigeria governance.

With facts, judgment and understanding of the issues facing the nation, the paper argues that the sustainable governance of Nigeria as a dynamic society will depend on the health of her educational institutions, and how well the ethical values of our education are incorporated to the nucleus of governance. The specificity here is the design studio aspect of architectural education curriculum.

The objective of this study epitomized the state of education and governance in Nigeria as a National-health issue. It also characterized a model of architectural design studio culture as learning-by-doing (LBDM) module, revealing its values and code of etiquette, as applicable to sustainable governance. This is not to force the studio culture on National governance system, but to propose its commitment, diligence, and civic engagement culture for sustainable governance (development). In this sense, the 'development meets the needs of the present without compromising the ability of future generations to meet their own needs'. Originally, the culture of architectural design process has in its service rendition to meet users' needs.

CONCLUSION (Implications for sustainable governance practice)

For as many that shared in the culture of the LBDM, dynamism and creativity are the twin key watchwords. Societal issues are not always static but dynamic; therefore leadership capacity should be developed via educational channels either in school or in governance institutions. For a dynamic societal architect (or would be leaders), he ought to be an educated man so as to leave a more lasting remembrance in his treatises. Secondly, he must have knowledge of drawing (a sense of imagination), so that he can readily make sketches along the flow line of inspiration to show the appearance of the work he proposes. Creativity requirements in this regard, presupposes the synthesis of imagination and engage the analytic mind to work out plans by life applicable Geometry. Geometry, also, is of much benefit in architecture of governance, and in particular, it teaches us the use of the rule and compasses, by which especially we acquire readiness in making plans for buildings in their grounds, and rightly apply the square, the level and the plummet. A dynamically creative society is known in her architecture of governance dealing with tangible objects- the leaders, society, their culture and environment. Geometry, in societal architecture also explains societal optics, because a piece of architecture, by principle gets day lighting from fixed quarters of the sky, so also the society needs maximum up-to-date illumination from society leaders possible through their feed-back mechanism by updating them with prevailing issues, educate them with 'what', 'how', where, and when of their resources; not being passive in self-assuming. The act of being mute on critically sensitive issues can plunge the leaders, the citizens and the environment (society) into an unnecessary *chaotic state.* But creatively dynamic abilities, like brainstorming, peer review, one-on-one interactions through logistics and strategic sampling (random or specific) of opinion from the societal perspectives can help to govern well. In other words, society by this methodical resolution approach will experience creatively sustainable governance. Sustainable governance entails deliberate and conscious engagement in teamwork facilitated by corporate leaders by strategic involvement of citizens in the landscape of governance. The intention is not to bring everyone physically to the corridors of power but incorporating their interest in the agenda, policy making and execution.

It also submits that, experiencing the LBDM process as a way of finding and being in flow, by society leaders (whether in politics, business, education e.t.c) as students enrolled in the simile of architectural design studio, would be better positioned to transfer their wealth of knowledge across a wide range of challenging situations; In higher institutions of learning, governance institutes, public offices, companies, workplaces, and other leadership positions. The language-in-use of the participants about LBDM challenge us to look at the transfer of knowledge not just in terms of transfer of specific knowledge to different problems or tasks but life-applicable terms (pragmatic) of transfer processes to different work and social life situations.

Another practical implication of this understanding is that the LBDM process may help to control and develop and establish Leaders' emotional intelligence. Dealing with the emotion of anxiety that arises from confusion is part of emotional intelligence. Goleman (1996, pp. 43-44) considers emotional intelligence to have five dimensions namely: knowing one's emotions, managing emotions, motivating one self, recognising emotion in others and handling relationships. LBDM learners (society leaders) can develop their emotional intelligence by not getting caught up in the anxiety or depression that can be part of confusion or the flatness of boredom but being aware of these negative feelings, and moving beyond them to use their awareness of emotions to help them in their learning and to enter flow (De Mello 1990; Goleman 1996).

Developing this type of emotional intelligence will help LBDM students (leaders) to face other challenging, unusually new, ever changing, demanding and confusing situations. Therefore, this paper suggested important

factors that should be built into the LBDM training process of our National governance system to foster leaders' capacity building and creativity. These include:
the use of large problems rather than the smaller two to three week long problems more commonly used in LBDM
democratic social relations
the LBDM process guide used as a reference rather than a straightjacket exercise
freedom and encouragement to define the parameters of learning and work in different media
allocated time for the team to reflect on the LBDM process
Leaders' induction and staff development programmes introducing the concept of finding and being in flow.
The benefits of developing leaders capacity and creativity include: "the undeniable increase in the rate of change or dynamics in educational curriculum and governance", the need to "enrich the future instead of impoverishing it" in relation to rapid globalisation and the importance of working at the interface of disciplines in the current climate of increased specialisation of knowledge" (Csiksentmihalyi, 2006, p. xiix).

The argument is that the potential of the LBDM training process to foster the building capacity and creativity of leaders and society has not been realised in many disciplines including education, and politics per governance. In this context there is a need to further research on the development of citizens and leaders' building capacity and creativity through learning-by-doing model (problem-based) processes in different university, Governance institute, policy and strategic institute programmes. Also inquisitively good for research are the specific factors such as enhancers and inhibitors of the development of creativity through the problem-based learning process in a range of disciplines.

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DEVELOPING A COMPTON SCATTERING TOMOGRAPHY SYSTEM FOR SOIL STUDIES: THEORY

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Abstract

Compton scattering tomography (CST) imaging method, developed by Norton in 1995 is being investigated and modified as a possible tool in the study of some soil physical characteristics like soil density, water content and soil particle sizes. By recording the number of scattered (back-scattered) photons as a function of energy and detector positions, the weighted line integral of the electron density over many overlapping circular paths, each uniquely determined by the photon energy and detector location is used to develop this CST image reconstruction formula. This formula was developed using an approximate solution that took into consideration the attenuation of pre-and post-scattered radiation. From the formula, computer simulated measurement of circular, polygonal, rectangular and square phantoms were performed and the result presented. The advantages of this CST method over the more familiar transmission tomography includes its applicability to in-situ soil studies situations where access to the object being studied at opposing sides is not available, extended objects in relatively hostile industrial environment, detection of buried land mines and flexibility in positioning of source and detector systems.

Introduction

Generally, Computed Tomography, (CT) can be viewed as the task of reconstruction of an unknown function from measurements of its line integrals. In X-ray transmission CT, this function is an unknown distribution of the linear attenuation coefficient. In Compton scattering tomography (CST), a form of tomography is proposed in which the unknown function is the local Compton scattering cross section and this quantity, which we assume to be spatially varying is related to the local electron density of the material. It varies depending on the material mass density and composition. The main attraction of CST is its ability to image directly the electron density distribution of materials rather than the attenuation coefficients as in the case of computed tomography (CT) using transmitted photons, as well as the flexibility offered by scatter imaging in the positioning of the detector, which do not have to be on opposite sides of the source as is required in transmission imaging. Unlike the case of X-ray transmission CT, where the tomography problem is characterized by line integrals defined along a set of overlapping straight lines joining multiple source and detector points, the CST problem of the system under consideration is characterized by line integrals measured over paths.

Norton, (1994) showed that neglecting photoelectric absorption for a γ-ray of known energy, emitted unto an object from a source point S, Compton scattered once, and detected at a point D outside the object, to a very good approximation, the energy loss suffered by the photon upon scattering is a function only of the scattering angle θ, subtended by the points S and D. Assuming the scattering is confined to a plane, the locus of scattering points having the same emitting point S, detecting point D, and scattering angle θ, or, equivalently, recorded

energy, $E_{\theta,}$ can be shown to be a circle whose centre and radius are uniquely determined by the three parameters S, D and θ (or energy E_θ), as shown in Fig.1.

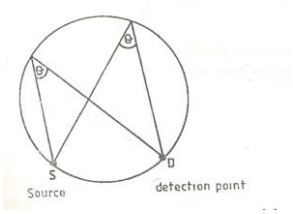


Fig.1. The source and detector subtend the same scattering angle θ at any point on the circle.

Thus, when point S is an omnidirectional source of γ-rays, the number of Compton scattered photons recorded at D with a particular energy E_θ is a (weighed) line integral of the electron density over this circular path. The CST method presented in this work is based on reconstruction of electron density images from measurements of its line integrals over families of overlapping circular paths. A complete set of path integral measurements, generated by recording the scattered photons as a function of energy and detector position, is sufficient to recover the unknown electron density. In the ideal case, i.e., (i) assuming perfect energy and spatial resolution of the detector (ii) neglecting noise and multiple scattering and (iii) assuming insignificant attenuation along the path between the source and scattering point and from that point to the site of detector(s), we find that the problem is analytically tractable and has an exact solution. In the CST problem, departures from the ideal case occurs when, (i) limits are imposed by the finite energy and spatial resolution of a real detector, (ii) incidence of multiple scattering, although this problem can be arbitrarily reduced by collimating both the source and the detector to one plane, thus reducing out-of-plane scatter. However, this is accomplished at the expense of a reduction in counting statistics, which increases data acquisition time. The result of this is an increased radiation exposure of the sample. This is obviously undesirable for medical applications and is not consistent with the ALARA (as low as reasonably achievable) principle of radiation protection in industrial applications. The most significant departure from the ideal situation is the assumption of negligible attenuation due to Compton scattering along the path from the source to the scatterer and to the site of the detector(s). Therefore in real situation, the detected scattered signal is modulated by the attenuation factors of pre- and post scattered radiation. These factors are a function of the unknown density of the object, which one is trying to obtain by imaging. (Arendtsz and Hussein, 1995).

Conclusions

We conclude this paper by presenting this proposal to take care of spatially-varying attenuation. A spatially-varying attenuation should vary and depend implicitly upon the Compton scattering cross-session, and hence on the object function $f(r, \theta_p)$ itself. A possible strategy for dealing with non-linear attenuation problem is to start with the assumption of a constant attenuation (eqn 19) and then reconstruct $f(r, \theta_p)$, using eqn 23, with the factor of eqn 19 incorporated into the weighting function w. The resulting reconstruction of $f(r, \theta_p)$, can then be substituted into eqn 23, to give a new correction factor which can in turn be incorporated again into w, and the process iterated until it "possibly" converges. This proposal is the subject of future research on this topic.

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ASSESSMENT OF BIOSTIMULATION USING SOME ORGANIC WASTES IN BACTERIAL RECLAMATION OF CRUDE OIL CONTAMINATED AGRICULTURAL SOIL

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ABSTRACT

Crude oil contamination of agricultural lands is a major problem in oil producing nations. Even the non oil producing nations that depend on supply through cross country underground and on high sea transportation are not spared due to accidental spillages. Apart from loss of farms, oil spills have led to shortened fallow periods, land use deterioration and led to a loss of soil fertility. The Effect of cow dung, sewage sludge and poultry droppings was tested in reclamation experiment. Nine of the twelve plots selected for this work were deliberately contaminated with Bonny light crude oil. The other three were uncontaminated (control). The Plots were left for seven days after which they were amended with the three organic wastes tested. The seeds of *Amaranthus* spp. were scattered in all the treatment plots and the control. Post planting irrigation was ensured for 10 weeks. Also cultures of the bacterial isolates were inoculated in all the plots. Seedling growth was monitored. Different parameters such as stem length, leaf length, leaf number and plant population were measured and counted respectively. Sewage sludge had shown better results than others, however, all the organic wastes showed appreciable effect in crude oil decontamination as indicated by growth and development of *Amaranthus* spp.

INTRODUCTION

Land contaminated by oil may be rendered unsuitable for plant growth by increasing the toxic contents in the soil (Nwankwo and Ifeadi, 1988). Crude oil shows a coagulatory effect on soil, it binds the soil particles and hence reduces aeration. Therefore, seed sown on such soils will fail to germinate (Ogboghodo *et al*., 2004). Heavily contaminated soils may remain un-usable for months or years until the oil has been degraded to tolerable levels (Eboe, 1986). Other adverse effects oil has on plant growth may range from root stress, morphological aberration and reduction in biomass.

Crude oil contamination of agricultural soils has dramatically affect food production particularly in oil producing areas. Also the use of cross country underground pipelines to convey crude oil and/or refined hydrocarbon products to different parts of Nigeria has led to more frequent instances of farmland contamination through pipe rupture and spillage. Oil contamination in soils result in imbalance in the carbon to nitrogen ratios. This

causes a nitrogen deficiency which not only retards the growth of agriculturally relevant microorganisms but even plants grown on such soils (Chikere and Chijioke 2006).

Crude oil contamination affects biodiversity which is critical to agricultural productions. For example, extensive destruction of insects due to oil pollution can affect pollination and hence fruit formation in seed plants. Also the birds which may suffer reproductive problems through reduced egg productions are important in dispersal of fruits. This may limit distribution of plant species leading to extinction. Sea birds are particularly affected by spills as the oil penetrates and open up the structure of their plumage thereby, reducing the insulating ability of their feathers. This makes them more vulnerable to temperature fluctuations. The smothered feathers also impair flight abilities. The oil may also cause kidney damage, altered liver function and digestive tract irritation in birds.

Nigeria has the third largest mangrove forest in the world and the largest in Africa (9.730Km^2) occupying the lower stretches of the southern limit of the Niger Delta and covering between 5,400Km^2 and 6000Km^2 (Niger Delta Environmental Survey, 2000). There are three main mangrove families (Rhizophoraceae, Avicenniaceae, and Combretaceae) comprising six species namely *Rhizophora racemosa, Rhizophora, mangle, R. harrisonii, Languncularia racemose, Avizeania germinans and Conocarpus erectus*) spreading in the Niger Delta, Nigeria (Research Planning Institute, 1985; NDES, 1996, 2000,; Niger Delta Development Commission, 2004) Another important component of the mangrove vegetation is the exotic Nypa palm (*Nypa fruticans*) of the family palmae introduced from Singapore Botanical gardens to Calabar and Oron.

The Mangrove plants (*Rhizophora* spp.) are salt tolerant species that grow on sheltered shores in the tropics and subtropical estuaries (International Petroleum Industry Environmental Conservation Association, 1993). They provide ecosystem functions and human utility benefits especially for coastal communities of Niger Delta, Nigeria. Their halophytic nature and ability to compensate for low oxygen in the soil allows them to flourish in the environment. However, their complex breathing roots make them vulnerable to crude oil which can block the openings of the breathing roots. This has posed serious threats to mangrove plants. The interaction between crude oil and breathing roots and pores leads to asphyxiating of the subsurface of the roots that depends on the pores for oxygen transfer (Odu *et al.,* 1985). This in turn impairs the normal salt exclusion process resulting in accumulation of excess salt in the plant contributing to enhancing the stress condition of the plant and ultimately, to death. On account of this, mangrove plants are vulnerable and undergo steady unpalatable decline in quality and functions in the integrity of the ecosystem. This is why in this research the effect of Bonny light crude oil on growth and development of *Amaranthus* seedlings using growth attributes (such as shoot length, leaf length, number of leaves, *vis a vis* Soil reclamation efforts using organic wastes was assessed. Apart from using anatomy in the systematic of plants, some other workers have also used anatomy of plant to monitor environmental pollution (Omosun *et al.*, 2008). Sharma *et al.,* (1980) have reported morphological and stomatal abnormalities as an effect of environmental pollution on plants. Also Gill *et al.*, (1992) reported that stomata in *Chromolaena odorata* were grossly affected by crude oil which manifest as distortion and reduction in the number of stomata per unit area of the leaf. Several workers have also reported the effects of crude oil on the growth and physiology of different plants (Terge, 1984, Gill *et al.,* 1992; Pezeshki and Delaune, 1992; Quinones – Aquilar *et al.,* 2003 ;)

DISCUSSION

The crude oil degrading bacteria shown in Table 1, fall within those reported by Kajasheikh *et al.*, (2002) and Okoh (2006). It can be seen from their biochemical reactions that they lack the necessary enzymes to metabolize carbohydrates. This probably could be the reason why they use hydrocarbon as an alternative carbon source. The results of crop yield parameters (stem height, leaf size, leaf number and plant population indicated in Tables 2-5 shows that sewage sludge is better than chicken droppings and cow dung. It can thus, be seen as a good resource in agricultural soil conditioning practice particularly, in pollution prone areas. The trend observed here may be attributable to enhancement of porosity of the soil thereby, making movement of nutrients and gases much easier. Thus, popularizing the use of treated sewage sludge in vegetable farming is an endeavour that has a potential in boosting agricultural productions while achieving sustainable environmental sanitation.

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ENVIRONMENTAL AESTHETICS AND SUSTAINABLE TOURISM DEVELOPMENT IN NIGERIA: A STAKEHOLDER PARTICIPATORY APPROACH.

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Abstract

Tourism means trade, jobs, development, cultural sustainability, peace and fulfillment of human aspirations. The global tourism industry has celebrated outstanding development in recent years and has become well positioned as one of the engine of economic, social and environmental development in many countries.
It is imperative therefore to note that for aesthetic look and psychological view of any tourism site to be sustained, the need to salvage the environment from the diverse impact of tourism should be paramount in the activities and programmes of all tourism stakeholders.
A survey carried out in Olumo rock tourism site in Abeokuta, revealed that about 82% of solid waste pollutants were caused as a result of tourism activities in the area, while the impact of human and vehicular congestions around the site cannot be over emphasized. Further findings also revealed that for effective environmental aesthetics to be sustained around tourism sites, travelers, visitors and tourists, should do all they can to minimize the negative environmental impacts of tourism.
The paper thus suggests a stakeholder participatory approach, which will facilitate a collaborative effort to permanently arrest the adverse effects of the activities of tourism on the physical environmental for sustainability.

Key Words: Environment, Aesthetics, Stakeholder, Tourism, Participation and Sustainability

INTRODUCTION

Environmental aesthetics is one of the four new areas of aesthetics that have been developed in the second half of the twentieth century. Although, it has emerged as a major field of study only recently and considers the aesthetic appreciation of human as well as the natural environment (Parsons, 2002), since its early stages, the scope of environmental aesthetics has broadened to include not simply natural environments, but also human influenced ones.

Consequently, the influence of human activities and endeavors on the natural environment has impacted the same both positively and negatively. One of these major activities within the human environment is that which involves tourism and its associated businesses.

The global Tourism industry has celebrated outstanding development in recent years and has become well positioned as one of the major engine of economic, social and environmental development in many countries. It has become a divers and complex industry, while enjoying a strong influence and significance on many issues, (Moutinho, 2000).

One of the issues of paramount concern to the urban planners is the environmental effects of tourism activities on the site and community where such tourism activity is located.

Consequently, cases of human and vehicular pollutions in such environment cannot be over-emphasized, while congestions and waste disposal and management problems ranked very high amidst other challenges associated with tourism.

The case of Olumo rock tourism site in Abeokuta, Ogun state is not an exception, as its ancient location has limited every effort of tourism site managers and planners to arrest the various problems associated with its location, human influences and activities and within the site. This notwithstanding, the aesthetic of the tourism environment must not be compromised from the benefits that may accrue from tourism, so that tourism can be sustained.

CONCLUSION

This paper has introduced a discussion of the key players in tourism planning and management with particular reference to Olumo Rock. The major stakeholders (tourists, the host community and government agencies) coupled with other operators, such as representatives of the travel industry and government agencies. NGOs and the media are all important players in the provision of maintenance services in and around the tourism site. The product of such services will enhance the beauty and cleanliness of the site.

In relation to tourists and host communities, it is important to note that neither group is homogeneous. This heterogeneity quality contributes to the complexity of planning and managing tourism. The government role in tourism often viewed as promotional rather than regulatory, although government at various levels fulfills both these roles. The tourism industry, although multi-faceted, and thus should involve the active participation of every tourism stakeholders. The paper is therefore is of the opinion that the effective participation of the major tourism operators (stakeholders) and private sector will enhance the speedy development as well as the management and promotion of the aesthetic value of the rock site.

In view of the above therefore, the need for collaborative relationship is recommended as a synergy for effective tourism management which should be strictly supported by policies and regulations.

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SUSTAINABLE SOLUTIONS TO THE WORLD PROBLEMS OF DESERTIFICATION

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Abstract

The world is facing a big challenge in the form of environmental degradation brought about mainly by global warming due to ozone layer depletion, loss of fauna and biodiversity due to deforestation and pollution. Experts are now concerned more than before about the implications of climatic changes taking place globally due to environmental mismanagement in the form of desertification, pollution, construction in inappropriate sites, non-renewable energy consumption, high-density habitation, improper waste management, bush-burning etc. The resultant episodes are the occurrences of flooding, wild fires, landslide, extinction of some species of aquatic life, drought, storm etc.

The contributions of various stakeholders like governments, corporate organisations and individuals in factors of environmental mismanagement like desertification, pollution - air, noise, water and land, mineral exploration, coastal zone mismanagement, improper waste management and improper land-use are discussed in the paper. The industrialisation of countries in the tropical region greatly helped in deforestation of these regions. Globalisation, information technology, improvement in communication and transportation which means that the whole world is now considered as a 'small village' are contributing immensely to forest clearing and coastal mismanagement in order for the perpetrators to make more profit.

In Brazil, the Amazon region has lost more than 60,000 square miles (150,000 square kilometers) of rainforest since 2000. Most of these destructions have been as a result of clearing for cattle pastures and agriculture (planting of arable crops and poultry), often in association with infrastructure development and improvements including construction of roads, bridges, storages and residences. Higher commodity prices, especially for beef and soy, have further spurred forest conversion in the Amazon region.

The concluding part of the paper discusses methods of sustainable management of desertification and the benefits of forestation and afforestation to man. It also shows that without the efforts of man, our environment will not replenish itself.

Key words: Afforestation, Deforestation, Desertification, Sustainable Development.

Introduction

Environmental mismanagement resulting in desertification, degradation, decay and demise of lower level living things in the ecosystem is a great challenge of the global community in recent times (Oyedele, 2010). This degradation has brought about the imminent global warming due to ozone layer depletion, loss of fauna and biodiversity due to deforestation and pollution. Of greater concern than other issues is the problem of desertification because of its effects on the environment like climatic changes and global warming. Desertification is mainly a product of forest clearing for agriculture, construction projects and bush-burning. The effects of these environmental mismanagement are occurrences of climatic change, global warming, flooding, wild fires, landslide, extinction of some species of aquatic life, drought etc.

Huricane Katrina remains the most devastating disaster in America. It occurred as from August 29, 2005 in east New Orleans (New York Times, 2005). This occurrence was attributed to the effect of global warming by world

scientists. Analysis of air captured in most cities revealed that they are highly polluted with carbon dioxide, carbon monoxide, nitric oxide and hydrogen sulphate. The government of London introduced Congestion Charging to reduce pollution in the city of London. But basic science shows that carbon dioxide is an input of plants production of energy through photosynthesis (Bazzar and Fadjer, 1992). A simple system to counteract the effects of environmental carbon pollution will therefore be the afforestation of our cities.

This simple principle must have informed the decision of the Lagos State Government of "one man one tree". With this scheme and with a population of over 9 million according to National Population Commission (NPC) census of 2006, Lagos State is poised to plant over 9,000,000 trees in recent times. Trees and of course, afforestation can act as shield or buffer to the Lagos slums. It can also serve as wind-breaker thereby militating against storms and floods. In developed countries, plants are used to differentiate communities and create sense of belonging and competition among inhabitants.

Human beings are just a fraction of the eco-system. But they have mismanaged the system as if they are the only stakeholders to the environment. Over utilisation of the land use in the form of construction, agriculture, high-density habitation and bush burning are the main areas where Homo sapiens abuse the environment. Due to his Gregariousness and most advanced brain, man has inadvertently change the climatology, topography and geology of the world leading to decrease in the population of other groups in the ecosystem. In some cases, human actions have led to extinction of its co-habitat of the environment.

The process of world desertification, its effects on the ecosystem and the modern management techniques will be discussed in this paper using Brazilian Amazon region as a case study.

Conclusion/Recommendations

Our environment is not a flow resource. We should not therefore manage it as such. While national governments should embark on mitigation schemes, local governments which are closer to the grassroots should embark on adaptation of national programmes. Though concerns about desertification are growing, it is not all doom and gloom. Efforts have been made to address land degradation and while there have been positive outcomes, more action is necessary to arrest and reverse land degradation and creeping desertification worldwide.

Despite its renowned effects, there is lack of proper awareness on the alternatives to environmental degradation especially desertification. Economic growth is an ambition of individuals, groups, organisations and nations. Any policy formulation on environmental quality management must therefore consider the culture of the people in which the environmental policy is to be formulated. The policy should aim to compensate the concern landholders.

The use of fertilizers, manures and crop rotation instead of clearing new forest lands should be encouraged among farmers. Land speculation among landholders especially in new areas should be discouraged. Land use map which demarcates the different uses of land in an area like residential, commercial, industrial, agricultural, forest, parks, transportation, recreation, sewerage, water treatment, sport etc, should be done by all communities.

Forest reserves and forest protection which are not part of carbon offsets scheme should be included especially in the Third world countries. Development approvals should be given to estate developers which incorporate the use of plants and preservation of the ecosystem. The best form of habitation of man is the one provided by nature. Efforts of man must be to preserve nature or minimally distort it in all his exercises.

Desertification like other forms of environmental degradation are carried out through exercises that brings about economic growth. But sustainable development of environment involves balancing economic, social and political benefits of environment developments. In China, Singapore and Malaysia, efforts are being concentrated towards developing eco-houses by developers. Plants incorporation in design of living areas are now given paramount considerations and are now widely in vogue.

Where industrialists have opened forest for industrial development, government should charge forest development levy to be used for reforestation and afforestation schemes in area closed to the cleared forest.

Desertification is not the only exercise through which human beings are degrading the environment, but it has been shown that its cessation will surely affect the environmental menaces like climatic change, global warming, hurricanes, storms, flooding and loss of aquatic animals and plants. Though the key drivers of Amazon deforestation are stronger than before, world-wide concerns over climate change and the effort to reign in greenhouse gas emissions may provide new economic incentives for landowners to preserve forest lands.

Afforestation, that is, the idea of planting trees with the aim of developing forests, for example 'tree planting exercise in Peru' and 'one man one tree in Lagos', will surely help in sustaining the environment. Desertification in the Amazon is being managed through a process called "avoided deforestation". Most governments in developing countries especially Africa, Asia, Latin America and the Caribbean have not adopted a working policy on afforestation.

Avoided deforestation is the process by which owners, that is, governments, communities, corporate organisations or landholders, sell the carbon rights to a given area to private investors. The private investor then sells the carbon credits on international markets to companies looking to offset their emissions. Under the existing Kyoto agreement, only reforestation and afforestation are eligible for carbon credits -- forest protection (forest reserves) is specifically excluded from receiving carbon credits -- but considerable momentum for avoided deforestation led to the careful consideration of the mechanism during the round of climate talks in Bali, Indonesia in December, 2009.

Also, a group of eight tropical countries containing 80 percent of the world's remaining tropical forest-cover, that is, Brazil, Cameroon, Congo, Costa Rica, Gabon, Indonesia, Malaysia and Papua New Guinea, – announced a partnership to push avoided deforestation at the upcoming conference on climate change.

Now that the possibility that carbon finance through avoided deforestation could become a reality soon, will it make economic sense for Amazon landowners to start protecting forest for carbon offsets rather than clearing it for cattle pasture, soybean farms, construction or board-feet of timber? Critical appraisal of the situation clicked 'yes', "carbon conservation" could be an attractive alternative to other uses of Amazon forest. Moreover, because living forest confers ancillary benefits -- including option value, store of heritage, biodiversity preservation, and other ecosystem services -- avoided deforestation would do more than help mitigate climate change.

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SOLAR POWERED BUILDINGS IN NIGERIA: CHALLENGES AND OPPORTUNITIES FOR THE FUTURE

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ABSTRACT
In our quest for sustainable development and the achievement of a safe environment, numerous alternatives to power supply have been exploited. The challenge of erratic and insufficient power has for decades bedevilled our dear nation resulting in the proliferation of the use of generators in multiple locations within the built environment. This solution apparently is the people's response to the nations decaying infrastructure but invariably produces an environment which is unsafe to its inhabitants. In recent times, reports have shown that the emissions arising from this practice have caused the death of occupants.
It is common knowledge that the use of solar energy as an alternative power source is not yet ubiquitous in this country. In recent times, innovation in the area of thermal solar and photovoltaics provide possibilities of its introduction in the building fenestration and facade. This study however examines some existing solar powered facilities in Abeokuta Nigeria. The Challenges and benefits of this scheme will be investigated while deriving essential design information for architects and allied professions. The future is bright but there is a great need to prepare for it.

Keywords: Solar energy, Alternative power, environmentally friendly

Introduction

The price of crude oil has quadrupled in the international market since the mid 1990s till date. This has had impact on the automotive, manufacturing, building industries creating a shift of focus to renewable energy sources. The global concern on Climate Change also poses a challenge on the design, sustenance of safer and cleaner environment. The creation of a future devoid of uncomfortable condition, pollution, and poor living standards has arisen from this concern.
Professionals in the fields of environmental design, technology, engineering and management should be seriously bothered about this development. The design, construction and maintenance of energy efficient buildings for the Nigerian environment will mark a stride towards proactively meeting global expectations.
This paper attempts to understand the level of integration of solar systems in community projects in some selected parts of Abeokuta while seeking to unearth the challenges militating against its widespread adoption.

Discussion and Conclusions

The initial capital investment for alternative power supply using solar systems is observed to be enormous but on the long run it offers such advantages as quiet operations, environmental friendliness, maintenance free operations and high reduction in cabling for external lighting.
However this study revealed that a number of challenges are militating against the success of the solar alternative power supply. The challenges include the following:

a. The quality and conditions of components if not properly ascertained before installation may affect operations adversely.
b. Lack of a well structured maintenance programme for the installations. Technical officers who understand the operations of the systems know the critical areas that should be monitored.
c. Proper installation of the PV panels determines the amount of power collected. Many believe that the roof top is the best position for installation irrespective of the designed slope of the roof.
d. Most installations are not considered at the design stages of buildings therefore resulting in land wastage and low efficiency of the systems.

Therefore, it is important for the relevant regulatory institutions to monitor the quality and conditions of components sold within or imported into the country considering the high financial implications involved. In addition, design professionals should take up the challenge to propose alternative energy sources to their clients so as to achieve complete integration of the systems within the design. Architect and Engineers in Nigeria really need to work together more than ever to be able to deliver the quality of services expected. Training of technician to be able to maintain smooth running of systems should be embarked upon to concretize the efforts of the design professionals.

Lighting is considered a major factor that promotes community security and more attention should be given to exterior lighting to improve the quality of life of residents.

In the event that the above suggestions are implemented we shall soon see wide acceptance of solar and other forms of renewable energy options being widely accepted in Nigeria.

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THE OXIDATION POND SYSTEM IN FOOD INDUSTRY EFFLUENT MANAGEMENT

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ABSTRACT

The fundamental purpose of the wastewater treatment facilities is to protect the environment from pollution. Under the 'glossary of terms' in the Guidelines and standards for Environmental Pollution Control in Nigeria, the Federal Environmental Protection Agency (FEPA) (1991) has defined Pollution as follows:

'Generally, the presence of matter or energy whose nature, location or quantity produces environmental effects. Under the clean Water Act, for Example, the term is defined as the man-made or man-induced alteration of the physical, biological, and radiological integrity of water'.

lndustrial wastewaters, contain high levels of organic solids and fermented starches from the processing of grains and would pollute the receiving stream if not adequately treated.

INTRODUCTION

The wastewater treatment system here in referred to as the 'plant', consisted of an alum-dosing chamber, a pair of sedimentation tanks, a number of flow division (flow diversion) boxes, and a pair of oxidation ponds. The treatment processes in terms of pre-treatment is followed by biological treatment.

Pre-treatment

The pre-treatment section consists of an alum dosing unit, and a flocculation/sedimentation unit.

The purpose of this section is to settle out much of the suspended solids in the wastewater, so that the quantity of solids that would settle in the ponds would be reduced. Without this pre-treatment the suspended solids load on the ponds would be high, resulting in frequent dredging operations which, invariably, are messy and expensive.

Alum dosing: Alum (in solution) is dosed into the wastewater in Manhole number l. Advantage is taken of the turbulence of the flow entering this chamber to effect rapid mixing of the alum with the wastewater, thus avoiding the need for a separate rapid-mixing system.

Flocculation: The wastewater mixed with alum arrives at the pre-treatment tank through the flocculation end.

Flocculation: (i.e. slow mixing of the alum – dosed – wastewater to promote development of settle able flocs) is simulated by a set of around-the end baffles ahead of the settling section.

Sedimentation: The flocculated wastewater is admitted into a pair of sedimentation tanks through gated entrance parts. Each sedimentation tank should have a sludge hopper and an effluent spillway (weir) . The tank floor should be gently sloped upwards (about 8%) from the sludge hopper to the weir bottom.

The two sedimentation tanks vent to be equipped with adjustable metal gates to permit use and/or de-sludging of either or both of the tanks.

Biological Treatment

Biological treatment of the pre-treated wastewater is achieved in the pair of oxidation ponds.

Each pond is by and large (as the land slope would permit) rectangular in plan and rectangular/trapezoidal in cross-section. It is equipped with a V-notch weir for determining the flow rate of the treated water.

Basis for design of ponds: describes a typical industrial wastewaters in terms of the parameters used in designing biological wastewater treatment plants. The ponds were designed on the assumption of an average

flow rate of wastes water at 60 m3 /hr and a retention time of about 10 days (assuming 10 effective working hours per day)

Actually, some high gravity waste water is very difficult to treat biologically. Studies had shown that such wastewaters, has a retention time of about 30 days which would be required in the oxidation pond for a reasonable level of treatment to occur. This would call for use of rather large land area. Indeed, it was the desire to reduce the retention time, and consequently the land area required, that led to the introduction of the pre-treatment unit at this plant.

V-notch weir for flow rate measurement:

Each of the two ponds has a flow outlet chamber equipped with a V-notch weir through which the supernatant is discharged.

The 90 degree V-notch design and construction are based on the Francis formula, namely:

$Q = 3.33(L - 0.2H) H1.5$

Where

Q = water flowing in cubic feet per second (cfs).

L = Length of weir opening in feet (ft)

H = Head on weir in feet (ft)

This formula was suitably adopted from imperial units to SI units so that Q is in liters per second and L and H are in meters.

DISCUSSION

Maintenance

A sewage treatment plant need not, indeed should not, be filthy. An untidy or odoriferous waste treatment plant reflects poorly on the owner(s) of such a system.

Since the wastewater treatment plant is a relatively simple one, maintenance requirements on it are also relatively simple. It is very important, however, that the maintenance be carried out regularly as a matter of duty.

The land area in which the plant is built should be weeded regularly. On no account should the place be allowed to be overgrown with weeds. Indeed, it is suggested that the entire area be regularly maintained.

As discussed earlier, the pre-treatment tank would need to be de-sludged from time to time. This should be done without dirtying up the surrounding. Sludge and scum removed from this tank should be disposed of aesthetically. The walls should also be brushed down and washed from time to time.

Floating matter should be raked off this tank and the pond as may be required. The outlet weir (V-notch weir0 on the pond should be washed regularly and so should the effluent chamber. It may be necessary also, with time, to keep down the growth of algae on the pond.

In short, a maintenance schedule should be developed that will ensure that competent personnel visit the facilities daily to ensure that the plant is running properly, to carry out required maintenance and to make such measurements and/ or collect such samples as may be required.

CONCLUSION

In ternational Breweries Plc llesa, which was used as basic study has shown a very good example to many other industries nation-wide. It is particularly gratifying that the company has done this largely voluntarily, that is without being forced by a regulatory agency.

Every effort should be made to run the plant properly, collect and record data regularly on it, and keep the plant and its surrounding s tidy and odour-free at all times

It is important to underscore the utility of the special feature of this plant; namely the provision of a pre-treatment unit ahead of the pond. With the coagulation and sedimentation system provided, much suspended

and colloidal solids in the brewery wastewater will settle in the tank (and be pumped out as sludge periodically) rather than settle in the ponds, thus avoiding messy and costly dredging of the ponds every couple of years.

We the desire for a higher-quality effluent, it is advised that the alum dosage be increased (to improve sedimentation in the pre-treatment tank) rather than being forced to build a whole new plant.

It is also advised that the effluent be chlorinated prior to discharging out. The decision to chlorinate should be predicated on the final quality of the final discharge water and whether it could be recycled.Tthe wastewater may not contain any micro-borne diseases such as cholera, typhoid fever, infectious hepatitis, amoebic dysentery, etc. should the industrial waste be inadvertently or deliberately mixed with domestic wastes in future, then chlorination would become mandatory.
Further, the Authorities may wish to consider constructing a fish pond using the effluent from the biological ponds as the source of the fish-pond-water.

AN APPRAISAL OF THE IMPACT OF CORPORATE SOCIAL RESPONSIBILITY EFFORTS BY OIL AND GAS COMPANIES ON SUSTAINABLE DEVELOPMENT IN THE NIGER DELTA.

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ABSTRACT

This paper explores the role and contributions of Corporate Social Responsibility (CSR) by oil and gas companies in the Niger Delta for the sustainable development of that most critically important economic and volatile region of Nigeria. In the Niger Delta, as else where, a contemporary issue for big business in the oil and gas sector and industry is the rising tide of environmental pressures and the unfolding of a whole new agenda on environmental performance requirements presented by sustainable development. CSR is a concept that is as broad as it is complex, with diverse approaches, and with no recognized standard. Consequently the approach adopted for in this paper is a formal assessment of CSR processes in four oil and gas multinationals in the Niger Delta to determine the model that is usually followed and motives; and to identify strengths and deficiencies in the adequacy of policies, plans, implementation and follow-up. Lessons from the case studies show the need to: incorporate such sustainable indicators as poverty alleviation, welfare, cultural issues including concern from women, children, and good behaviour which is an indicator of wellbeing; alignment of the CSR objectives with the goals of participatory decision-making to achieve sustainable development through attributing key role for local communities; greater transparency and participation by the civil society by an adherence to democratic principles in planning and revenue utilization for the provision of economic and social welfare infrastructure; and enthronement of accountability, inclusion and ethnical and moral concerns in the CSR process. Consideration of future prospects for enhancing the effectiveness of CSR for achieving positive outcomes in the sustainable development of the Niger Delta concludes the paper.

Optimizing Thermal Comfort and Energy Efficiency for Residential Sustainability in Nigeria: A Design Approach

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Abstract

The current situation of global warming and climate change is one of the most critical components of environmental degradation that poses a great challenge to sustainable development in the built environment. In the face of these challenges, the essential role of architecture is still to provide built environment that sustain occupant's safety, health, physiological comfort and productivity. Hence, the building sector has an important role and global potential to help protect the environment as well as increase life comfort and well being.This has therefore brought to the fore the essential consideration of climate in the design of building which has a major effect on the performance of building, its occupants comfort and energy consumption. A study conducted in Bauchi northern Nigeria, shows that in hot dry season, occupants of residential buildings complain of thermal discomfort and this has led to much dependence on the use of artificial energy for indoor comfort. In this study, thermal comfort evaluation of residential buildings within Bauchi metropolis was carried out via both environmental measurements and questionnaires.The study aims to put forward some basic principles that can be used in provision of indoor comfort for sustainable designs in residential buildings especially in hot dry area of Nigeria. Recomendations were given to achieve sustainable architecture in an age of dwindling resources and questionable climatic stability.The paper concludes that architects through design approach should pay maximum attention to designing buildings that can adapt to local climatic conditions in order to provide the needed occupants' comfort while at the same time minimising the use of artificial energy.

Keywords*: climate change, energy efficiency, residential buildings, sustainable design, thermal comfort.*

Introduction

Increasing concerns about global warming and climate change present the building industry with a challenge to cut its energy consumption. In many developing countries, the rapid urbanization that is occurring has important implications for energy consumption in the building sector. And as a result, millions of apartments and houses are added to accommodate the growing population in the urban areas, which in turn create new demand for energy to power lights, appliances, heating and cooling systems. Hence, the growing need for energy efficiency in the building sector. According to United Nations Environment Programme (UNEP), energy efficiency is defined as the ability to provide the same (or higher) level of energy services, such as thermal comfort, high quality lighting, etc. at lower energy consumption and cost (UNEP, 2007). Energy efficiency is increased by investing in improvements in the design and the technology used in the building. Energy efficient buildings have higher levels of thermal comfort, greater ability to be operational in the face of energy supply disruptions, and encourage greater productivity of their occupants.

Building design in tropical areas, particularly in warm and humid climate like Nigeria, should aim at minimizing heat gain indoors and maximizing evaporative cooling of the occupants of the spaces so as to achieve maximum thermal comfort (Lawal, 2008). Aside from the fact that the use of building design and proper material specification to directly or indirectly reduce annual active energy consumption is supported by many authors, measures to promote energy efficiency in existing and proposed residential

buildings in the country is also important. However, in Nigeria, there has not been much study conducted to see what can be done in the area of providing thermal comfort and energy conservation in residential buildings (Akande and Adebamowo, 2010). Hence, the lack of climatic adaptation of most residential buildings has resulted to problems of thermal discomfort of occupants and energy consumption within the building. The study aims to put forward some basic design principles that can be used in optimizing indoor thermal comfort and energy efficiency for residential sustainability especially in hot dry area of Nigeria. Meanwhile, the objective is to develop some design guidelines which would enable architects to adopt the appropriate design strategies that are conducive to making better use of the natural environment and resources during the initial conceptual design stage for residential buildings in Nigeria.

Conclusion

Climate is a principal physical environment factor in the design of buildings and settlement hence, climatic design creates comfortable, energy efficient and environmentally wise buildings. The role of architects in sustainable development is to contribute through designing buildings, which achieve the objectives of sustainability. In order to achieve sustainable development, buildings must be designed inclusive of the concepts of sustainable development. Such buildings will have a positive impact on the environmental, social and economic systems, which will lead to enhancing both the economic well being and environmental health of communities and the quality of life. Therefore, architects should pay maximum attention to design buildings that can be adapted to local climatic conditions in order to provide occupancy comfort while using minimum artificial energy.

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