

TECHNOSCIENCE REVIEW

(An international science, engineering, technology & development academic research journal)

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TECHNOSCIENCE REVIEW

(An international science, engineering, technology & development academic research journal)

The **aim** of the *Technoscience Review (TR)* derives from the **mission** and **objective** of the Publishers, *Welfare & Industrial Promotions (WIPRO) International*, as follows:

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EDITORIAL

For many centuries, technological advances of great significance were made without benefit of knowledge from science. The iron production, printing, and hydraulic engineering, including dams, canals, irrigation systems, water wheels, canal locks, barbed wire, food preservation, fermentation and many metallurgical processes are instances where technology ran ahead of science. The steam engine was commonplace before the science of thermodynamics elucidated the physical principles underlying its operations.

With the growth of the chemical and electrical power industries in the 19th century, scientific knowledge was of direct use in solving of problems and the development of products, although it was rarely sufficient on its own. Later, the communication and electronic industries manifested the effectiveness of a close relationship between science and technology, as indeed did the experience of World War II and subsequent more local military conflicts. By the second half of the 20th century, much modern technology was intimately related to scientific knowledge, and science itself had become increasingly linked to technology through its dependence on complex instrumentation to explore the natural world.

More similarities than differences can be found between science and technology. Both terms imply a thinking process, both are concerned with causal relationships in the material world, and both employ methodology that results in empirical demonstrations that can be verified by repetition. The symbiotic and synergistic relationship between modern science and modern technology has thrown up the term “technoscience” to describe the essentially merged, even hybrid, enterprise.

So far, academic journals appear to dissect and concentrate on various aspects of technoscience, rather than merge them. Thus, there are journals of science, technology, engineering, and others. There is the need for an academic research journal of technoscience, to integrate the various aspects of technoscience, which have become hybridized, especially at the rapid rate of technoscientific development and growth. The aspiration to fill this gap has birthed *Technoscience Review*.

This issue, 3 (1&2) of November 2012, contains some very enriching papers. In the first article, titled *Urbanization and solid waste*

management challenges in Nigeria, Ugwuanyi, R.O. and Isife, C.T., both Research Fellows of the Institute for Development Studies, Enugu Campus, University of Nigeria, Nsukka, review urbanisation and solid waste management challenges in Nigeria. The paper x-rays the factors of urbanization and the consequent solid waste generation. The challenges of solid waste management include inadequate infrastructure, paucity of environmental policy and legal framework, poor environmental planning, budgetary and operational constraints, overpopulation, and inadequate environmental education. The review recommends environmental education to be included in the school curricula to educate and create awareness, acquire the knowledge, value, skills, experience of the environment and waste disposal methods. Efficient solid waste management mechanism should be put in place for the needed appropriate coping capacity with increasing waste generation consequent upon increasing urbanization in Nigeria.

In the second article, titled *Herbal medicines: Alternatives to orthodox medicines in Ezeagu and Nsukka communities in Enugu State, Nigeria*, Chima Theresa Isife (Mrs.), a Research Fellow with the Institute for Development Studies, Enugu Campus, University of Nigeria, Nsukka, investigated the reasons behind the reported dwindling patronage of orthodox health care facilities in Ezeagu and Nsukka communities of Enugu State of Nigeria. Findings revealed, among others, that most common ailment in these communities is malaria, use of herbs for treatment of ailments is common in these communities, reasons for use of herbs depend on the nature of the ailment, belief in herbal option is widespread, males are more inclined to the use of herbs than women, using herbal medicine is believed to be less expensive than orthodox medicine, hospital/health centres are widely known to be available within less than 1 km. Recommendations include creating awareness on efficacy of herbal medicines in order to encourage their use, facilitating the formation of clusters among herbal practitioners for collective impact, enhancing sustainability of the commendable indigenous health practices, and creation of databank for herbal use, healer skills and cultural resources in Nigeria.

In the third paper, titled *Chemical explosives: Warhead allies*, Onyenekenwa Cyprian Eneh, Senior Research Fellow with the Institute for Development Studies, Enugu Campus, University of Nigeria, Nsukka presents a review on chemical explosives, which he brands as warhead allies. He submits that interactions among humans and international communities result in occasional misunderstanding, which may mature into dispute, quarrel, conflict or war. To secure victory, the warhead may inflict damage on the target enemy, mostly by a transfer of mechanical energy, producing shock wave or lethal fragments. The motivation for the study is the fragmented and disharmonious nature of the literature on chemical explosives. Seeking to update and harmonise resources on the all-important subject, the review is structured under brief introduction, the difference between chemical explosives and other exothermic reactions, chemical explosive materials, classification of explosive materials, barrier and initiation of explosive reactions, chemical explosives and their uses, and implications for development. It recommends the discouragement of the production and use of chemical explosives in favour of Green Chemistry.

In the fourth paper, Osefoh, F.C. of the Department of Architecture, University of Nigeria, Enugu Campus, Nigeria reports on the research conducted in 2011 in the Centre for Education, Research and Conservation of Primates and Nature (CERCOPAN), Calabar, Nigeria, which deals with rescued, captured and donated primates. Species were quarantined, nurtured, rehabilitated and sent back to protected wild habitats. Findings showed that the environment can be holistically ameliorated through afforestation and conservation.

In the fifth article, Paul Okeleke of the Evangel University, Abakaliki, Nigeria reviews the implementation of Nigeria's Local Content Development Management Policy as an imperative leverage for industrialisation of the country. So far, the paper contends, the implementation is yet to meet the expectations, even though the present government at the centre is determined to deliver.

Professor Ignatius U. Obi

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In the sixth paper, Emeka Edmund Emodi of the Caritas University, Amorji-Nike, Enugu, Enugu State, Nigeria investigated the residential housing environmental quality status of low, medium and high density neighbourhoods of Enugu metropolis. Questionnaires were used to collect data, while field tests were carried out to determine the noise level, as well as the air quality in the area. The analysis of variance was used to compare the environmental quality among the different density areas. Findings revealed that different residential density areas have different environmental quality values. High density areas have higher quality than medium density areas. Recommendations included strict adherence to and enforcement of the law of zoning in the development of the area and proper public enlightenment to educate residents.

In the seventh article, Dr. G.A. Emerole of the Department of Agrisbusiness and Financial Management, Michael Okpara University, Umudike-Umuahia, Abia State, Nigeria, S.O. Anikwe and D.U. Ayogu both of the Department of Management, Faculty of Business Administration, Enugu Campus, University of Nigeria, Nsukka, Nigeria examined the effects of training and retraining on health worker efficiency. They contend that, to enhance competence and output, organizations ought to put in place measures for employee training and retraining. The study examined the effects of training and retraining on health institution worker competency enhancement in Nigeria with specific emphasis on federal health sector workers in Southeast Nigeria. Questionnaire on likert-scale was administered to 269 respondents to generate the data analysed with the chi-square non parametric statistics in order to test the hypothesis. Findings showed that training and retraining of health workers enhanced organisational competence in the Nigerian health sector. The study recommended, among others, improved government emphasis on training programmes for health personnel to further enhance competence in Nigerian health institutions.

Guide to authors is provided in the column on 'Call for articles.'

URBANIZATION AND SOLID WASTE MANAGEMENT CHALLENGES IN NIGERIA

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Abstract

Urbanisation is a growing issue. So is the consequent waste generation and its management challenges. This paper reviews the factors of urbanization and consequent solid waste generation and their attendant management challenges in Nigeria. The challenges of solid waste management include inadequate infrastructure, paucity of policy and legal framework, poor environmental planning, budgetary and operational constraints, overpopulation, and inadequate environmental education. It is recommended that environmental education should be included in the school curricula to educate and create awareness, acquire the knowledge, value, skills, experience of the environment and waste disposal methods. Efficient solid waste management mechanism should be put in place for the needed appropriate coping capacity with increasing waste generation consequent upon increasing urbanization in Nigeria.

Introduction

Through most of history, the human population has lived a rural lifestyle, dependent on agriculture and hunting for survival. In 1800, only 3 percent of the world population lived in urban areas. By 1900, almost 14 percent were urbanites, although only 12 cities had one (1) million or more inhabitants. In 1950, 30 percent of the world population resided in urban centres. The number of cities with over 1 million people had grown to 83 (Tolba, 2003).

The world has experienced unprecedented urban growth in recent decades. In 2008, for the first time, the world population was evenly split between urban and rural areas. More developed nations were about 74 percent urban, while 44 percent of residents of less developed countries lived in urban areas. However, urbanization is occurring rapidly in many less developed countries. It is expected that 70 percent of the world population will be urban by 2050 and most urban growth will

occur in less developed countries (Satterthwar, 2009).

An urban area may be defined by the number of residents, the population density, the percentage of people not dependent upon agriculture, or the provision of such public utilities and services as electricity and education. Some countries define any place with a population of 2,500 or more as urban; others have a set of criteria for distinguishing urban areas (Hauser & Schnore, 1965).

The classification of metropolitan includes both urban areas as well as rural areas that are socially and economically integrated with a particular city. A city grows through natural increase - the excess of births over deaths - and because the in-migration of people from other cities, rural areas or countries, is greater than out-migration. More developed and less developed countries of the world differ not only in the percentage of the population living in cities, but also in the way

in which urbanization is occurring (Mabogunje, 1968).

During the 19th and early 20th centuries, urbanization resulted from and contributed to industrialization. New job opportunities in the cities spurred the mass movement of surplus population away from the countryside. At the same time, migrants provided cheap, plentiful labour for the emerging factories. While the proportion increased through rural to urban migration, high death rates in the cities slowed urban growth. Cities were unhealthy places because of crowded living conditions, the prevalence of contagious diseases, and lack of sanitation. Until the mid-1800s, the number of deaths exceeded births in many large European cities. Migration accounted for as much as 90 percent of city growth during that period. Urbanization in most less developed countries in the past 50 years contrasts sharply with the experience of the more developed countries. Death rates have fallen faster in urban areas because of greater access to health services. Because birth rates are relatively high in most less developed countries, such as Nigeria, the rates of natural increase are also quite high in the cities (Onibukun and Kumuyi, 1996). Migration also fuels urban growth in less developed countries as people leave the countryside in search of better jobs (Merrick, 1986).

Available statistics show that the cities of Nigeria grew by 5.8% per annum between Independence in 1960 and 1993. This is more than twice the rate of increase of the total population (UNDP, 1997; NPC, 1999; PRB, 1998). By 1999, 36.2% of Nigeria's population lived in urban areas, up from 19% in 1963. There are of course appreciable differences among the States in terms of the proportion of their population in urban centres. For instance, Jigawa has an urban population of 6.9%, compared to Lagos with 93.6%. It is projected that nearly 50% of the county's

population will reside in urban areas by 2025 (UN, 1987; Olowu, 1999).

The 2006 census records on distribution of regular households by method of solid waste disposal (Nigeria National Population Commission, NPC, 2006) show that, of 28,197,085 tonnes of solid waste generated in Nigeria, 5,439,274 were collected, 2716,037 were buried, 5,759,200 were disposed at the public approved dump site, 7,965,527 were disposed at the unapproved dump site, 5615,273 were disposed by burning, while 701,774 were disposed by other unknown methods. This shows that more solid wastes were disposed of in unapproved sites. This is not a welcome development for the country. Indiscriminate disposal of solid waste needs to be addressed in the country, especially as urban growth rate in Nigeria is phenomenal due to in-migration from rural areas, decreasing death rate due to improved access to health facilities, and high rate of population growth.

Nigeria's population growth rates have been high at 3.2% in the 1980s and 2.83% in the early 1990s (National Planning Commission and UNICEF, 1998). This means a phenomenal increase in the amount of solid wastes generated in the cities, since a person generates an average of 2.4 tonnes of wastes in a year. This poses growing challenge to solid wastes management in these cities. Solid refuse analysis for Onitsha indicated a high percentage of solid wastes and paper/wood products, while the generation rate is 0.53kg per capita per day (Agunwamba, et al., 1998).

This work attempts to review the causes of urban growth, the attendant massive solid wastes generation and the challenges to solid wastes disposal and management in Nigeria. Also, urban problems, different wastes disposal methods, how urbanization has led to massive wastes generation and the constraints in the solid waste are included in the review.

Background literature

Available literature (see Onibukun and Kumuyi, 1996; Olowu, 1999; Agunwmba, et al., 1998) show that solid waste problem is as old as man. It is dynamic and so changes over time. All over the world, and especially in developing countries, including Nigeria, population explosion, uncontrolled urbanization and industrialization have caused high rate of wastes generation with its attendant poor disposal and management. This can present a danger to human health and the environment. The difference between the volume of solid waste generated and rate of evacuation or accumulation is an index of the degree of effectiveness of solid waste management. It can be safely argued that the first step in the effective control of solid waste and management of the environment for sustainable development is the development of qualitative environmental education and awareness.

Municipal or urban solid waste includes predominantly household (domestic) wastes with sometimes the addition of commercial wastes collected within a given municipality. It may be in semisolid form and generally excludes industrial hazardous wastes. The term residual waste refers to waste left from household sources containing materials that have not been separated out or sent for reprocessing. Wastes could be in form of biodegradable waste, such as food and kitchen waste; green waste; and paper. Recyclable materials include paper, glass, bottles, cans, metals, certain plastics, among others. Inert wastes include construction and demolition wastes, dirt, rocks, debris. Composite wastes include waste clothing, waste plastics, such as toys. Domestic hazardous waste (also called "household hazardous waste") and toxic wastes include pharmaceutical and medical wastes, paints, chemicals, light bulbs, fluorescent tubes, spray

cans, fertilizer and pesticides containers, batteries, shoe polish.

Waste generation encompasses activities in which materials are identified as no longer being of value and are either thrown away or gathered together for disposal. Waste handling and separation involves the activities associated with management of waste until they are placed in storage container for collection. Handling also encompasses the movement of loaded containers to the point of collection. Separation of waste components is an important step in the handling and storage of solid waste at the source.

The functional element of collection includes not only the gathering of solid waste and recyclable materials but also the transport of these materials, after collection, to the location where the collection vehicle is emptied. Other functional elements of collection include the transfer of waste from the smaller collection vehicle to the larger transport equipment and the subsequent transport of the wastes, usually over long distances to a processing or disposal sites. The location may be a material processing facility, a transfer station or a landfill disposal site (Sattehwaite, 2009).

Today the disposal of wastes by land filling or land spreading is the ultimate fate of all solid wastes, whether they are residential wastes collected and transported directly to a landfill site, residue from the combustion of solid waste, compost or other substances from various solid wastes processing facilities.

The literature also contrasts urban and rural areas, village and city and city and super or mega city. The U.S Census Bureau considers any incorporated community to be a city, regardless of size, and defines any city with more than 2,500 residents as urban (UN, 2007). In a rural area, most residents depend on agriculture or other ways of harvesting

natural resources for their livelihood. In an urban area, by contrast, a majority of the people are not directly dependent on natural resource-based occupations. A village is a location of rural households linked by culture, custom, family ties, and association with the land. A city, by contrast, is a differentiated community with a population and resource base large enough to allow residents to specialize in arts, crafts, services, or professions rather than natural resource-based occupations (Sada & Oguntoyinso, 1981). While the rural village often has a sense of security and connection, it also can be stifling. A city offers more freedom to experiment, to be upwardly mobile, and to break from restrictive traditions, but it can be harsh on inhabitants. An urban area is considered a super city or mega city, if it is composed of cities. Mega cities in many parts of the world have grown to enormous size.

Since their earliest origins, cities have been centres of education, religion, commerce, record keeping, communication, and political power. As cradles of civilization, cities have influenced culture and society far beyond their proportion of the total population (Mckeown, 1976). Until recently, however, only a small percentage of world people lived permanently in urban areas and even the greatest cities of antiquity were small by modern standards. The vast majority of humanity has always lived in rural areas, where farming, fishing, hunting, timber harvesting, animal herding, mining, or other natural resource-based occupations provide support.

Since the beginning of the Industrial Revolution some 300 years ago, however, cities have grown rapidly in both size and power. In every developing country, the transition from an agrarian society to an industrial one has been accompanied by urbanization, an increasing concentration of the population in cities and society to a metropolitan pattern of organization, bringing many benefits, especially to the top members of society, but they also cause many problems (Emeribe, 2000).

Nearly half the people in the world now live in urban areas. Demographers predict that by the end of the twenty-first century, 80 or 90 percent of all humans will live in cities and that some giant interconnecting metropolitan areas could have hundreds of millions of residents. Lives may be threatened by the desperate environmental conditions in these cities than by any other issue (Okpara, 1995).

The literature gives the causes of urban growth. Urban populations grow in two ways: by natural increase (more births than deaths) and by immigration. Natural increase is fueled by improved food supplies, better sanitation, and advances in medical care that reduce death rates and cause populations to grow both within cities and in the rural areas around them (Hamza, 1985). In-migration to cities can be caused both by push factors that force people out of the countryside and by pull factors that draw them into the city.

In-migration push factors are many. In other words, people migrate to cities for many reasons. In some areas, the countryside is overpopulated and simply cannot support more people. The “surplus” population is forced to migrate to cities in search of jobs, food, and housing. Not all rural-to-urban shifts are caused by overcrowding in the countryside. However, in some places, economic forces or political, racial, or religious conflicts drive people out of their homes.

Land tenure patterns and changes in agriculture also play a role in pushing people into cities. Furthermore, where land ownership is concentrated in the hands of wealthy elite, subsistence farmers are often forced off the land so it can be converted to grazing lands or monoculture cash crops.

In-migration pull factors are equally many. Even in the largest and most hectic cities, many people are there by choice, attracted by the excitement, vitality, and opportunity to meet others like themselves. Cities offer jobs, housing, entertainment and freedom from the constraints of village traditions. Possibilities exist in the city for

upward social mobility, prestige, and power not ordinarily available in the country. Modern communications also draw people to cities by broadcasting images of luxury and opportunity. We generally assume that beggars and homeless people on the streets of teaming third world cities have many of these people want to be in the city. In spite of what appears to be dismal conditions, living in the city may be preferable to what the country had had to offer.

Government policies often favour urban over rural areas in ways that both push and pull people into the cities. Developing countries commonly spend most of their budgets on improving urban areas (especially around the capital city where leaders live), even though only a small percentage of the population lives there or benefits directly from the investment. This gives the major cities a virtual monopoly on new jobs, housing, education, and opportunities, all of which bring in rural people searching for a better life.

Current urban problems

Large cities in both developed and developing countries face similar challenges in accommodating the needs and by products of dense populations. The problems are most intense, in rapidly growing cities of developing nations (Tolba, 2003).

Bad city planning and refuse disposal sheme

Bad planning and indiscriminate erection of walls and housing structures block water flow channels to form big floods. Bad refuse disposal schemes marked by indiscriminate dumping of solid waste and thrash in drainages and stream channels results in clogging of flow path of rainwater and pollution of surface water systems.

Traffic and congestion

A first-time visitor to a super city, particularly in a less developed country, is often overwhelmed by the immense crush of pedestrians and vehicles of all sorts that clog the streets. The noise, congestion, and confusion of traffic make it seem suicidal to venture onto the street.

Air pollution

The dense traffic (commonly old, poorly maintained vehicles), smoky factories, and use of wood or coal fires for cooking and heating often create a thick pall of air pollution in the world's super cities. Lenient pollution laws,

corrupt officials, inadequate testing equipment, ignorance about the sources and effects of pollution, and lack of funds to correct dangerous situations usually exacerbate the problem (Taylor, 2003).

Sewer system and water pollution

Few cities in Nigeria can afford to build modern waste treatment system for their rapidly growing populations. The World Bank estimates that only 35 percent of urban residents in developing countries have satisfactory sanitation services. Absence of sewage proper disposal system cause pollution of surface and ground water systems rendering them unfit for human consumption and contributing to fresh water and degeneration of sanitary conditions in urban areas.(Durotoye, 2003).

Housing

The United Nations estimates that at least one billion people - 20 percent of the world population live in crowded, unsanitary slums of the central cities and in the vast shantytowns and squatter settlement that ring the outskirts of most third world cities. Around 100 million people have no home at all.

Rapid urbanization of small towns results from fast population increase, force human occupation of flood prone areas. Massive destruction of natural ecosystem in

the process of urbanization alter natural flow channels to form big floods.

The increase in population in urban areas reduces the agricultural land. This is a threat to food production, sustainable agriculture and food security (Ekpenyong, 2007).

Food security

Waste management

Waste is everyone's business. We all produce wastes in nearly everything we do. According to the United States Environmental Protection Agency, the United States produces 11 billion tonnes of solid waste each year. About half of that amount consists of agricultural waste, such as crop residues and animal manure, which are generally recycled into the soil on the farms where they are produced. They represent a valuable resource as ground cover to reduce erosion and fertilizer to nourish new crops, but they also constitute the single largest source of non-point air and water pollution in the country. More than third of all solid wastes are mine tailings, overburden from strip mines, smelter slag, and other residues produced by mining and primary metal processing. Road and building construction debris is another major component of solid waste. Much of this material is stored in near its source of production and is not mixed with other kinds of wastes.

Improper disposal practices however can result in serious and widespread pollution (Brown, 2003). Refuse is mostly buried, but some reckless open-burning ensues, so posing environmental hazards (Igoni, 2007).

Industrial waste, other than mining and mineral production, amounts to some 400 million tonnes per year in the United States. Most of this material is recycled, converted to other forms, destroyed, or disposed of in private landfills or deep injection wells.

About 60 million metric tons of industrial waste falls in a special category of hazardous and toxic waste. Municipal waste is a combination of household and commercial refuse amounts to more than 200 million

metric tons per year in the United States. That is approximately two-thirds of a tonne for each man, woman, and child every year - twice as much per capita as Europe or Japan, and five to ten times as much as most developing countries.

The waste stream

Much garbage is generated and discarded every year. There are organic materials such as yard and garden wastes, food wastes and sewage sludge from treatment plants. Junked cars, worn-out furniture, and consumer products of all types are part of this. Newspapers, magazines, and office refuse make paper one of our major wastes. In spite of recent progress in recycling, many of the 200 billion metals, glass and plastic food and beverage containers used every year in the United States end up in the trash. Wood, concrete, bricks, and glass come from construction and demonstration sites, dust and rubble from landscaping and road building. All of this varied and voluminous waste has to arrive at a final resting place somewhere. The waste stream is a term that describes the steady flow of varied wastes that we all produce, from domestic garbage and yard wastes to industrial, commercial and construction refuse. Many of the materials in our waste stream would be valuable resources if they were not mixed with other garbage. Processes mix and crush everything together making separation an expensive and sometimes impossible task. In a dump or incinerator, much of the value of recyclable materials is lost.

Another problem with refuse mixing is that hazardous materials in the waste stream get dispersed through thousands of tonnes of

miscellaneous garbage. The mixing makes the disposal or burning of what might have been rather innocuous stuff a difficult, expensive, and risky business (Adindu, 1990). Spray paint cans, pesticides, batteries (containing zinc, mercury, lead), cleaning solvent, smoke detectors (containing radioactive material), and

plastics (that produce dioxins and polychlorinated benzenes, PCBs, when burned) are mixed willy nilly with paper, table scraps, and other nontoxic materials. Household toxic and hazardous materials should be separated for safe disposal or recycling.

Wastes disposal methods

Open dump

For many people, the way to dispose of waste is to simply drop it someplace. Open, unregulated dumps are still the predominant method of waste disposal in most developing countries. The giant Third World mega cities have enormous garbage problems. Until recently, most of this torrent of waste was left in giant pits, exposed to the wind and rain, as well as rats, flies and other vermins. Most developed countries forbid open dumping, at least in metropolitan areas, but illegal dumping is still a problem (Adindu, 1978). We clearly need better enforcement of anti-littering laws as well as a change in our attitudes and behaviour.

Ocean dumping

The oceans are vast but not so large that we can continue to treat them as carelessly as has been our habit. Every year, some 25,000 metric tonnes (55 million pounds, lbs) of packaging and plastic containers are dumped in the sea beaches. Even remote regions are littered with the non-degradable flotsam and jets of industrial society.

Landfills

Over the past 50 years, most American and European cities have recognized the health and environmental hazards of open dumps. Increasingly, cities have turned to sanitary landfills, where solid waste disposal is regulated and controlled. To decrease smells and litter and to discourage insect and rodent populations, landfill operators are required to compact the refuse and cover it every day with

a layer of dirt. This method helps control rodent population, but the dirt fill also takes up as much as 20 percent of landfill space. Since 1994, all operating landfills in the United States have been required to control such hazardous substances as oil, chemical compounds, toxic metals, and contaminated rainwater that seep through piles of waste. An impermeable clay and/or plastic lining underlies and encloses the liner to catch drainage and to help monitor chemicals that may be leaking. More careful attention is now paid to the siting of new landfills. Sites located on highly permeable or faltered rock formations are passed over in favour of sites with less leaky geologic foundations. Landfills are being built away from rivers, lakes, floodplains, and aquifer recharge zones, rather than near them, as was often done in the past. More care is being given to landfills long-term effects so that costly clean ups and rehabilitation can be avoided.

Historically, landfills have been a convenient and relatively inexpensive waste disposal option in most places, but this situation is changing rapidly. Rising land prices and shipping costs as well as increasingly demanding landfill construction and maintenance requirements are making this a more expensive disposal method (Imam, 2008). Suitable places for waste disposal are becoming scarce in many areas. Citizens have become more concerned and vocal about health hazards, as well as aesthetics.

Exporting waste

Although most industrialized nations in the world have agreed to stop shipping hazardous and toxic waste to less developed countries, the practice still continues. This affects the health of the people in the recipient countries, since the wastes contain mercury, lead and high level of other toxic metals.

Incineration and resource recovery

Another term commonly used for this technology is energy recovery or waste-to-energy, because the heat derived from incinerated refuse is a useful resource. Burning garbage can produce steam used directly for heating buildings or generating electricity.

There are types of incinerators. Municipal incinerators are specially designed burning plants capable of burning thousand of tonnes of waste per day. In some plants, refuse is sorted as it comes in so as to remove unburnable or recyclable materials before combustion. This is called refuse-derived fuel because the enriched burnable fraction has higher energy content than the raw trash. Another approach, called mass burn, is to dump everything smaller than sofas and refrigerators into a giant furnace and burn as much as possible. This technique avoids the expensive and unpleasant job of sorting through the garbage for non-burnable materials, but it often causes greater problems with air pollution and corrosion of burner grates and chimneys. In case, residual ash and unburnable residues representing 10-20 percent of the original volume of burned garbage is reduced by 80-90 percent, disposal is a smaller task. However, the residual ash usually contains a variety of toxic components that make it an environmental hazard if not disposed of properly.

Recycling

It is obviously better to have less waste to discard, instead of struggling with disposal methods, all of which have disadvantages and drawbacks in the environment. The term recycling has two meanings in common usage.

Sometimes, the term recycling is used for reusing of something, such as refillable beverage containers. In terms of solid waste management, however, recycling is the reprocessing of discarded materials into new, useful products. Some recycling processes use materials for the same purposes. For instance, old aluminum cans and glass bottles are usually melted and recast into new cans and bottles. Other recycling processes turn old materials into entirely new products. Old tires, for instance, are shredded and turned into rubberized road surfacing. Old newspapers become a valuable soil amendment materials, and steel cans become new automobiles and construction materials.

Shrinking the waste stream

Enormous volumes of waste is produced in industrialized societies, and there is an increasing problem of how to dispose of this material in an environmentally safe manner. Old landfills were often messy and leaky, but new ones are required to have impermeable clay or plastic linings, drainage, and careful siting. Incineration can destroy organic compounds, but whether incinerators can or will be operated satisfactorily is a matter of debate. Recycling is growing nationwide, encouraged by the economic and environmental benefits it brings. Near major urban centres, land suitable for waste disposal is becoming increasingly scarce and expensive. Some cities now ship their refuse to other States or even other countries, but worries about toxic and hazardous material in the waste are leading to increasing resistance to shipping or storing it.

Hazardous and toxic wastes, when released into the environment, cause such health problems as birth defects, neurological disorders, reduced resistance to infection, and cancer. Environmental losses include contamination of water supplies, poisoning of the soil and destruction of habitat. The major categories of hazardous wastes are ignitable, corrosive, reactive, explosive, and toxic. Some materials of the greatest concern are

heavy metals, solvents and synthetic organic chemicals, such as halogenated hydrocarbons, organophosphates, and phenoxy herbicides.

Disposal practices for solid and hazardous wastes have often been unsatisfactory. Thousands of abandoned, often unknown waste disposal sites, still leak toxic materials into the environment. Some

alterative techniques for treating or disposing of hazardous wastes include not making the material in the first place, incineration, secure landfill, and physical, chemical, or biological treatment to detoxify or immobilize wastes. Shrinking the amount of generated wastes has become imperative.

Challenges to waste management in Nigeria

Physical constraints

The major constraint to waste management includes physical and economic problems. Physical constraints to waste management include lack of comprehensive planning, inadequate infrastructure and development crisis. Comprehensive physical planning incorporates conceiving the plan and considering various aspects of the plan of the urban area in terms of waste generation and disposal.

Inadequate infrastructure

Many Local Government Areas lack the capacity to meet infrastructural services for waste generation in rapidly growing areas. When vehicles to evacuate waste and other infrastructures are not provided or inadequate from the Local Government to the State Government, there will be problem in handling the waste generated by the populace (Agumbnwamba, et al., 1998).

Development crisis

The expansion of urban development to urban fringes poses a threat to sustainable development and management of environmental resources. Plan policies to accommodate population growth are inadequately made (Agunwamba, 1998).

Budgeting

The Federal Government's budget for environmental protection is inadequate. This makes waste management allocation to be so negligible, leading to poor waste management.

It was found that a great part of the budget (77%) was spent on collection and haulage, leaving a minor amount (23%) for waste disposal (Agunwamba, et al., 1998).

Over population

When an area is densely populated, the quantity of waste being generated will be much. The populace disposes the waste both in approved and unapproved sites, thereby causing the problem of waste management in the urban areas (Agagu, 2009).

Environmental education and participation

Environmental Education has been described by Eguabor (2008: 78) as:

A permanent process in which individuals and the community gain awareness of their environment and acquire the knowledge, value, skills, experience and the determination which will enable them to act individually and collectively to solve present and future environmental problems”.

There is no environmental education and awareness on the effect of waste disposal, which will enable the people to know how to dispose of the waste from the homes and agricultural waste (Adindu, 1990).

Production of master plans

Master plans of Local Government Areas in Nigeria is not prepared and enforced as a guide for both private and public authorities. Such

policies will protect environmentally sensitive areas and address the waste management procedures (Adedibu, 1984). It will be a control approach to environmental management and will regulate environmental degradation.

Poverty, underdevelopment and ignorance

Poverty, underdevelopment and ignorance are factors that militate against environmental

quality and waste management in Nigeria. This is evidenced by the piling of solid waste in various parts of the urban centres. Refuse heaps have encroached on or completely blocked roads, thereby obstructing traffic in the urban cities. Uncontrolled refuse disposal has always been associated with serious health hazards (Dharam and Vivan, 1995).

Recommendations

The existing solid waste management system is affected by unfavourable economic, institutional, legislative, technical and operational constraints. A reliable waste collection service is needed, and waste collection vehicles need to be appropriate to local conditions. More vehicles are required to cope with increasing waste generation. Waste needs to be sorted at source as much as possible, to reduce the amount requiring disposal. Co-operation among communities, the informal waste collectors and the authorities is necessary if recycled materials need to be encouraged. Markets for recycled materials need to be encouraged. Despite recent improvements in the operation of the existing dumpsite, a properly sited engineered landfill should be constructed with operation

contracted to the private sector. Wastes dumped along roads, underneath bridges, in culverts and in drainage channels need to be cleared. Small-scale waste composting plants could promote employment, income generation and poverty alleviation. Enforcement of waste management legislation and a proper policy and planning framework for waste management are required. Unauthorized use of land must be controlled by enforcing relevant clauses in development guidelines. Accurate population data is necessary so that waste management systems and infrastructure can be properly planned. Environmental education should be included in the schools curriculum to enable individuals acquire the knowledge and bring about sound environment.

Conclusion

The task of protecting and preserving the entire environment is an enduring one that depends on the level of a country's socio-economic and political development. Solid waste management should be provided with a separate head for the purpose of adequate revenue allocation, implementation and monitoring. There is need to enhance environmental education programs and public participation as it affects solid waste management, not only through the radio, television and print media, but also through the grassroots enlightenment campaigns via the

Chiefs, Ezes, and Emirs. For, effective solid waste management requires the involvement, participation and cooperation of local communities and the government. Government should commit itself to sponsoring more research projects into the reduction of solid waste at source, collection and efficient disposal. Primary school and secondary school curricula should have detailed topics on solid waste management.

Since the country would not be able to afford an expensive curative approach to environmental degradation resulting from poor

solid waste management, there is need to adopt a more efficient approach to preventive management environmental education.

Environmental education and public participation option lead to an increasing awareness that environmental precautions are

important for continued sustainable economic development in the long run. Moreover, a degraded environment cannot sustain a continued growth and it undermines the entire country's development effort.

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HERBAL MEDICINES: ALTERNATIVES TO ORTHODOX MEDICINES IN EZEAGU AND NSUKKA COMMUNITIES IN ENUGU STATE, NIGERIA

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Abstract

Reports show that in-patient and out-patient hospital attendance declined from 45,000 in 1980 to just 25,000 in 1985. This work sought to establish the factors responsible for the dwindling patronage. A total of 255 respondents were randomly selected for the survey that used questionnaire to elicit information. Data were analyzed using simple frequencies and percentage tables. The Chi-square test was used to test the hypotheses. Findings revealed, among others, that the most common ailment in these communities is malaria, use of herbs is common in these communities, reasons for use of herbs depend on the nature of the ailment, belief in herbal option is widespread, males are more inclined to the use of herbs than women, using herbal medicine is believed to be less expensive than orthodox medicine, hospital/health centres are widely known to be available within less than 1km. Recommendations include creating awareness on efficacy of herbal medicines in order to encourage their use, facilitating the formation of clusters among herbal practitioners for collective impact, enhancing sustainability of the commendable indigenous health practices, and creation of databank for herbal use, healer skills and cultural resources in Nigeria.

Introduction

Health is an important and reoccurring issue for individuals, communities, and nations. The World Health Organization sees health as “a state of complete physical, mental and social well-being and not mere absence of disease or infirmity” (WHO, 2003). Health also occupies a prominent place in the United Nations declaration of the Millennium Development Goals (MDGs).

The health status of a people in any geographical setting is so important that if the leaders of that nation fold their arms and do nothing to improve citizen’s health condition, it will only be a matter of time before plagues or diseases will ravage such people. It is for this reason that health care delivery forms a very

important aspect of any nation’s policy. When individuals are in good health, they can engage fully in their daily social, economic and religious activities. For this reason, countries place great premium on health to enjoy the fruit of their labour.

In realization of the importance of health, all tiers of Government in Nigeria devote large sums of money in their annual budgets to health care. For instance, in 2009, a total sum of ₦103.46 billion was earmarked for the health sectors (Nigerian Village Square, 2008). For the 2011 budget the Federal Government of Nigeria proposed to spend a total amount of ₦235, 866, 438,244 for the health sector. Out of which the total personnel

cost was put at =N=192, 885,136,258; total overhead cost N9,453, 716, 258; total recurrent N202, 338, 852,916; total capital cost N33, were allocated to the health care sector. Despite the huge amount allocated to the health sector, most Nigerians especially the rural dwellers are yet to enjoy the health facilities in their various areas. They still lack good and proper medical services, hence they resort to the use of the alternatives to solve their health problems (Omeje, 2000). Issues of concern include access, distance, cost, inadequate personnel and drugs amongst others facilities. This explains why many Nigerians are going for alternative forms of healthcare.

Aside from these, Onah (1995) is of the opinion that the nature of illness very much determines where people seek for treatment. Diseases perceived to emanate from the spirits or with peculiar manifestations like “ogbuoo o gbalaa” the healthy killer of pregnant women, or “ itebi” that distorts a pregnant woman’s breasts enlarging them out of proportion and rendering them useless for suckling, clearly belongs to the traditional healers.

It is, therefore, not surprising that Ukwu and Nwakoby (1989) in their study of the use of health facilities noted a declining patronage of Anambra government facilities. In-patient and out-patient hospital attendance according to them declined from 45,000 in 1980 to just 25,000 in 1985. Concerned with the declining patronage in these hospitals, the State Government set up a panel of enquiry to establish the factors responsible for low patronage. Memoranda received by panel set up to investigate the problems in the health service showed that the most serious obstacles to health sector included deficient basic facilities, inadequate drug supplies, poor staff attitude and performance, deficient 24-hour coverage and time wasting protocol (Ukwu and Nwakoby, 2000).

527, 630, 328 (Federal Ministry of Finance, 2011). These yearly expenditures show that enormous budgetary resources

The poor state of health is not peculiar to Anambra State alone. The health system in Nigeria and the health status of Nigerians are in a deplorable state. Nigeria’s overall health system performance was ranked 187th position among the 191 Member States of World Health Organization in 2000. At the sub-national level, available statistics for Enugu state shows that, health status indicators are worse than the average for sub-Saharan Africa. For example, infant mortality rate of 115/1000; under 5 mortality rate 205/1000; and maternal mortality ratio of 948/100,000 (339/1000, 000 to 1,716/100,000) is one of the highest in the world (SEED, 2004).

Disease programmes, such as HIV/AIDS; Tuberculosis (TB), Malaria and other programmes like reproductive health are currently implemented within a weak health system and hence have had little impact. Routine immunization coverage rate of over 80% in the early 1990s has dropped to less than 25% and is only now beginning to show marginal improvements. Primary health care facilities serve only about 5-10% of the potential load. Public expenditure on health is less than \$10 per capita compared to the \$34 recommended internationally. Private expenditures are estimated to be over 70% of the total national health expenditure with most of it coming from out-of-pocket expenditures, in spite of the endemic nature of poverty in Nigeria. Given this background, it is thus not surprising that the herbal medicine use is on the increase in Nigeria.

Health facilities have over the years been disproportionately concentrated in urban areas, to the disadvantage of the rural peripheries, where majority of the populace reside. The local governments whose responsibility it is to implement the health

policy as it concerns the rural areas are politically, financially and professionally handicapped. Poor funding of the local governments also compounds the problem, since almost all funds allocated to them are used to service salaries and emoluments. Most rural areas across the country therefore lack adequate access to health facilities. Other issues

As it were, many Nigerians are increasingly relying on traditional medicine in the treatment of ailments. In most rural areas in Enugu State, it is common for individuals to rely on herbal medicine, even when there are orthodox health care facilities. This study is, therefore interested in investigating the indigenous knowledge and alternative health care practices in selected communities in Ezeagu and Nsukka Local Government of Enugu state, Nigeria.

Objectives of the study: The specific objectives include the following:

- i. To determine the peoples attitude to the use of herbal medicines in treating health issues in these communities.
- ii. To assess the socio- economic effect on the citizens using the herbal medicines and the practitioners in these communities.
- iii. To assess the relationship between the income of the users of herbs and the continued patronage to the herbal medicine in these communities.

Hypothesis

The null hypotheses formulated to guide the study were:

H₀₁ There is no significant difference between people's attitude to the use of orthodox medicine and traditional medicine in treatment of ailments

that rural dwellers contend with which include poverty, illiteracy, ignorance, and power structures (within and among households, inter and intra-gender which affect their use of orthodox health care facilities. The problem of low usage of orthodox medicine in the treatment of ailments is also compounded by the issue of fake and substandard drugs.

H₀₂ There is no association between socio-economic status of the people and the use of alternatives to orthodox health care facilities

H₀₃ There is no association between the income of the users of herbs and the reliance of the people on the herbs.

Research questions

To guide enquiry, the following research questions were posed.

- i. What are the people's attitude to the use of orthodox medicine and traditional medicine in treatment of ailments?
- ii. What are the socio-economic status of the people using herbal treatment for their ailments?
- iii. What is the relationship between the use of herbs and the income of the users?

Significance of the study

Findings from this work will enable the Local Governments and the State Governments to see the need to create enabling environment for enhancement of indigenous knowledge in tackling the health needs of the people. The local practitioner will equally benefit from the study, which will reveal their beneficial role as partners in development.

The scope of the study

This study restricted itself to the study of the citizen's indigenous practices in the use of herbal medicine in selected communities in Ezeagu and Nsukka Local Government Areas of

Enugu State, Nigeria. The communities selected in Ezeagu Local Government Area were Awha Imezi and Awha Ndi Agu in Imezi; Ihile Akpa and Edem-ani communities in Edem were selected from Nsukka L.G.A.

Conceptual and theoretical Framework

Rural community

The term rural communities are used to describe people, places, traditions and spaces. It is also employed as a setting of study as well as an object of study (AvRuskin, 2000). In spite of these descriptions, there is no universal agreement on what the definition should be. In spatial occupation are culturally and historically determine, and so vary among regions of the world. One outstanding debate on the rural concept is whether 'rural' is a geographical concept, a location with boundaries on a map, or whether it is a social representation, a community of interest, a culture or a way of life (Plessis *et al*, 2001). This explains why questions as to what is rural, the identification of its features and the attempt at its understanding are continuing themes in literature (Blunden *et al*, 1998).

It is generally agreed that a population supported by extensive land use within a sparsely populated, open country is rural. These features, according to Wolf and Fischer (2003), are the primary marks of rural areas. These primary marks are supported by distinctive cultural patterns, which are usually exhibited by people residing in rural areas. In accordance with the primary and cultural perspectives, rural areas have been characterized by specific open landscape, a relatively low population, the greater part of the population is associated with agriculture and forestry, traditional (close nature) life style and habits, extensive use of land, a scarcity of built up areas and settlement that is dispersed, and a preponderance of inhabitants considering themselves country dwellers (Halfacree, 1995; Banski and Stola,

fact, the concept of rurality has been a subject of long-standing debate. The debate arises because it has been an impossible task to build an objective or incontrovertible definition of "rural" (Study Programme on European Spatial Planning, 1999). The problem of definition arises because the patterns of (2002). Following the characteristics outlined above, It becomes obvious that 'rural' is a spatial entity. It is in this regard that Madu (2008) defines rural as an area of low population density utilizing land extensively and exhibiting distinctive socio-cultural characteristics. The characteristics of rural communities have been shown to be related to relatively, high level of poverty (Ite, 2001). In this regard it might be very difficult for the rural dwellers to make use of orthodox medicine when they are sick, because of their economy.

Herbal medicines

Herbal medicines are extracts from plants, such as herbs, barks of woody trees, roots, seeds, berries, flowers and leaves. They are organic in chemistry, and are endowed with elements that are harmonious with the health chemistry of man. Herbal remedies are not used to treat diseases alone, but are used to rehabilitate and modify the tissues, to build up the body immune system, so that it can fight diseases on its own. This is to say that a disease is not cured by adding chemical poison to the body, but by a systematic elimination of them. Western medicine, sometimes, seem to do exactly the reverse.

Health care delivery

The concept health care delivery connotes health care in general and specifically, to examine the role which is assigned to the health sector in terms of services delivery. Health care is a complicated and many-sided subject. Quite apart from economic considerations, there are other equally important and sometimes overriding considerations; regarding health care delivery concept. For instance health care has its policies, as well as its logistic, and overall, its philosophy or lack of it (Akinkugbe *et al.*, 2001).

Orthodox versus traditional medical practices

The Webster's Ninth New College Dictionary defines traditional as the handing communication. The World Health Organization (WHO) (<http://www.unescobkk.org> 2003), defines traditional medicine as "knowledge based on the theories, beliefs, and experiences indigenous to different cultures either codified in writing or transmitted orally and used in maintenance of health as well as the prevention, diagnosis, improvement, or treatment of physical and mental illness (or social imbalance)".

Indigenous knowledge

Indigenous knowledge (IK) is the local knowledge - knowledge that is unique to a given culture or society. IK contrasts with the international knowledge system generated by universities, research institutions and private firms. IK is a basis for local-level decision making in agriculture, health care, food preparation, education, natural-resource management, and a host of other activities in rural communities (Warren, 2001). It is the information base for a society, which facilitates communication and decision-making.

The Oxford Advanced Learner's Dictionary 6th Edition provides a more agreeable perspective by defining orthodox as beliefs or behaviour generally accepted or approved. Therefore, orthodox medicine can be rightly considered as synonymous with accepted, approved, established, sanctioned and authoritative approach to medical practice. Each of these words clearly connotes a high degree of credibility.

Macintosh (<http://www.tldp.com/medicine>, 1999) alluded to the difficulty of finding appropriate definition of orthodox or conventional medical practice when he noted the term "does not appropriately describe the practice of that form of medicine (as does allopathic), but rather it provides it with a sanctioned power."

down of opinions, doctrines, practices, rites, and customs, especially by oral Indigenous information systems are dynamic, and are continually influenced by internal creativity and experimentation as well as by contact with external systems (Flavier et al, 2005). Indigenous knowledge is important in the emerging global knowledge economy. A country's ability to build and mobilize knowledge capital is equally essential for sustainable development (World Bank, 1997). The basic components of any country's knowledge system are its indigenous knowledge. It encompasses the skills, experiences and insights of people, applied to maintain or improve their livelihood.

To concretize its genuine interest in traditional medicine, WHO opened a Traditional Medical Unit in Geneva, headed by a Nigerian. The World Health Organization believes that traditional medical practice does not pose any dangers as it has always been feared by most orthodox medical practitioners. In support of this Organization's stand on traditional medicine, the WHO Regional Director General for Africa insisted that "we must not neglect a weapon that is valuable."

(WHO, 2003). The WHO realizes the decisive role played by traditional medicine in the Medicare delivery system especially in Third World countries. For example in Nigeria alone, it is estimated that 75% of the population rely on traditional medicine for Medicare. But for the meantime, WHO has shown that we may drive out nature with a pick fork, but she will always hurry back. "We respect the knowledge of Traditional Health Practitioners. We learn from their experiences. We try to cooperate with them. We learn from what they know. They have the trust of their communities; this status we must fully support. We will not change who they are, only improve their capability wherever necessary. We must let them speak. We should always consult them when developing strategies for collaboration. We should involve them in decision taking. Sharing mutual trust; if want their help, we must show our respect for them in return. They are the richest source of community health care. We should remember that we want them as allies". treatments. There must be an alternative to this" (Stanway, 1986).

We might ask some pertinent questions. Is traditional medicine really significant enough to attract government budget and financial support? How is traditional medicine tackling grassroots health care delivery to merit governments' sympathy and financial and moral support? A critical look at the health care coverage of traditional medicine especially in rural areas will reveal the significant role it is playing in the health care system of this country. Due to lack of motorable roads, pipe-borne water, electricity supply, and other essential amenities in rural areas, many Western-trained doctors do not seem to have keen interest to work in remote villages, and these harbour the bulk of the population of this country. So the healthcare of those citizens remains at what the traditional healers can

On the other hand, traditional medicine practitioners argue that before the advent of orthodox medicine, it had been in existence and had been taking care of the health problems of the people. For this reason, it claims to be the mother of orthodox medical practice. However, despite the rigorous training coupled with the scientific researches and skills, orthodox medicine has not yet found the cure for diabetes, sickle cell anaemia, arthritis, ulcers, cancers, and the likes. This shows that no science is independent of each other and underscores the need for cooperation. Traditional medicine further recognizes that in the past 100 years of orthodox medical practice in Nigeria supported by Federal and State governments, it covers and serves only 25% of the population. Finally, traditional medicine laments the incidence of serious problem which needs urgent attention, that of iatrogenic or drug-induced diseases: "A survey conducted showed that somewhere between 3 and 18 percent of all patients in hospital are suffering from side-effects caused by their drug afford to provide. Moreover, there is a declining interest and confidence in orthodox therapies due to drug side-effects and the inability of orthodox therapies to tackle certain cases (especially chronic ones).

There is also another aspect of people's yearning which orthodox medicine does not take into account, and that is the socio-cultural values. According to Ayodele, 1983, as already noted, majority of Nigerians, about 75% simply have to make do with traditional medicine (Chukwura et al, 2003). Many rural communities have great faith in it because it takes account of their particular socio-cultural background which orthodox medicine has often complexly ignored. Clearly therefore, the choice before us is to recognize the potentialities of traditional medicine in an organized official manner.

It is worth noting that under the current 1999 Constitution, only vague reference is made to the responsibility of Local Government for health. In Section 45, the Constitution makes provision of among other things, public health. The current Constitution, therefore falls short of specifying what roles the State and Federal Governments must play in the health care delivery system. For the health sector, this is a very serious omission since Nigeria's current health system is built on a three-tier system, with Local Government Areas (LGAs) being the main implementing agents of primary health care.

Indigenous Knowledge System and Sustainable Socio-economic Development

In Nigerian society, some people embrace traditional medicine in the treatment of some ailments such as fractures & wounds, fever, convulsion, diarrhea, infectious diseases that are observed in the study as common. The issue of traditional versus orthodox medical practices generated controversy among society members and orthodox medical practitioners in the past. Traditional medical organizations, in the bid to align their modes of operation with orthodox medicine, tend toward the following choices: traditional delivery practices in obstetrics & gynecology, but local treatment of

bone fractures and wounds in orthopedic surgery, local treatment of children sickness, diseases and ailments in pediatrics as well as local treatment of fever, infections, and other ailments in general medicine.

Indigenous knowledge is, generally speaking, the knowledge used by indigenous inhabitants of a land to make a living in a particular environment (Warren, 2001). Local knowledge refers to the knowledge possessed by any group living off the land in a particular area for over a period of time but not necessarily indigenous to the land. Contrary to some prejudiced assertions about its backward and static nature, indigenous knowledge is creative, experimental and constantly incorporates in selective manner outside influences and inside innovations to meet new conditions. Indigenous knowledge is dynamic and results from a continuous process of experimentation, innovation and adaptation. In this way, it recognizes the need, on one hand, for cultural continuity and on the other hand, for reform and change. Indigenous knowledge in its broadest sense includes all of the social, political, economic, technical, aesthetic and spiritual aspects of an indigenous community's way of life. It is precisely this dynamic nature that has not allowed indigenous knowledge

Research Methodology

The study is based on survey research design. The rationale for choosing the survey method of the research design is because of the large population under study.

This study is concerned with the survey of the people's persistent use of herbal medicine in treatment of ailments even when they have the orthodox medicines available in the locality. This design is supported by Nworgu (1991), who said that the survey research design is one in which a group of

people or items is studied by collecting and analyzing data from only a few people or items considered to be representative of the entire group.

Sources of data

This study made use of primary data obtained from the field through the structured questionnaire consisting of different items based on the research questions formulated to guide the study. The designed questionnaire

contains the socio-economic and demographic information of the respondents and other questions that capture the objectives of the study.

Population of the study

The population of the study consisted of residents of Ezeagu and Nsukka Local Governments Areas of Enugu State. The available data showed that both Local Governments have a population of 20,000. These comprise of both males and females. The sample population consisted of 1400 males and 1200 females from the four selected communities in both Local Government Areas respectively, making the entire sample population 2600 were used.

Sampling

A total of 347 respondents were selected from Ezeagu and Nsukka Local Government Areas of Enugu State. To select the samples, by stratified random sampling technique. Nsukka Local Government Area consists of Edem, Opi, Edeobala, Okpuje, Ala-uno, Ibeagwa-Ani, Okutu, Nsukka, Obukpa, Eha-alunona, Aluka, Ibeagwa-agu and Obimo, while Ezeagu Local Government Area consists of Iwolo, Akam ohe,

Amansi, Oyoho, Neke, Owe, Awha, Olo, Agobu Awha, Imezi Owa, Mgbagu Owa, Obinihia Ndi Uno, Obinohia Ndi Agu, Obelagu Umanah, and Agba Umanah. Two communities in Edem (Akpa and Edem-ani) were randomly selected as well as Awha Imezi and Awha Ndi Agu) of Imezi in Ezeagu. The stratification used in distribution of the questionnaires was to every household after the next five households in both areas of study.

Data Analysis

Simple frequency tables are used in summarizing the answers supplied by respondents. Simple percentages (%) were used in presenting the data collected.

The data were analyzed using SPSS version 16 statistical analysis. A non-parametric statistical test instrument- the Chi-Square was used to test the formulated hypotheses.

A total of 347 questionnaires were randomly distributed among the four selected communities in both Ezeagu and Nsukka L.G.A of Enugu State. Out of this number 256 questionnaires were returned. This gives the return rate of 73.8%.

Data presentation

Social Demographic Characteristics of the Respondents

Age distribution

The majority (49%) of respondents were in 40-49 age brackets. Those in 50 and above age

brackets were 53 in number (or 20.8%). Those in 30-39 age brackets were 41 in number (or 16.1%). Those within 20-29 age brackets were 31 in number (or 12.2%) (see Table 1).

Table 1: Age distribution of respondents

Age	Frequency	%
20-29	31	12.2
30-39	41	16.1
40-49	125	49
50 and above	53	20.8
Total	255	100

Source: Fieldwork, 2011

Gender distribution

Male respondents were 160 (or 62.7%) and female were 95 (or 37.3%) (Table 2).

Table 4.2: Distribution of respondents by gender

Sex	Frequency	%
Male	160	62.75
Female	95	32.25
Total	255	100

Source: Fieldwork, 2011

Marital status

Two hundred and twenty two (222), married; 49 (or 19.2%) were single; and 3 respondents (or 1.6%) were widowed (Table 3). representing 79.2% of respondents, were

Table 4.3: Distribution of respondents by marital status

Marital status	Frequency	%
Married	202	79.2
Single	49	19.2
Widowed	3	1.6
Total	255	100

Source: Fieldwork, 2011

Income distribution

The income of the majority (52.1%) of the respondents fell within =N=5,000-10,000 per month, while the least (2.4%) fell within the =N=16,000-20,000 per month (Table 4).

Table 4: Distribution of respondents by income

Income (=N=)	Frequency	%
5,000 – 10,000	130	52.1
11,000 – 15,000	68	22.8
16,000 – 20,000	12	2.4
21,000 and above	45	22.7
Total	255	100

Source: Fieldwork, 2011

Educational attainment

The majority (43.1%) had primary education by those with non-formal education (28.6%) while the least (3.5%) belonged to those with as their highest education attainment, followed TC11 (Table 5).

Table 5: Distribution of respondents by educational attainment

	Frequency	%
Non-formal	73	28.6
Primary	110	43.1
Secondary	63	24.7
TC II	9	3.5
Total	255	100

Source: Fieldwork, 2011

Religion

Most respondents (239 or 93.7%) were Christians, while 14 (5.5%) were traditional religionists, and only 2 (or 0.8%) were Muslim (Table 6).

Table 6: Distribution of respondents by religion

Religion	Frequency	%
Traditional	14	5.5
Christianity	239	93.7
Islam	2	0.8
Total	255	100

Source: Fieldwork, 2011

Occupation

The occupation of most respondents was trading (70.9%). Civil servants constituted 15.7%, while the least (13.3%), were farmers (Table 7).

Table 7: Distribution of respondents by occupation

Occupation	Frequency	%
Farming	34	13.3
Trading	181	70.9
Civil service	40	15.7
Total	255	100

Source: Fieldwork, 2011

Results show that 29.4% of respondents were sick in the last 4-7 months, while 7.5% were sick in the 13 months ago. Majority (78.5%) of the respondents suffered malaria, while the least (3.1%) had typhoid. The common treatment option adopted by 67.8% of the respondents was use of herbs, while 32.2% of the respondents opted for orthodox medicine. Majority (69.4%) of respondents used the available herbs, and (83.9%) accepted that usage of herbs was popular and regular in these communities. Higher percentage of respondents (27.5%) used herbs in the last 8-12 months 6.7% that used herbs more than 13 months ago. About 64.5% of respondents use herbal treatment option for effective treatment, 31.0% for proper healing, 2.0% had other reasons for their preference for herbal

medicines. About 78% of respondents claimed good treatment outcome by herbs, while 3.1% believed otherwise. About 42% of respondents accepted that herbal treatment could cure infertility problems, while 18% believed that herbs were effective for treatment of stomach problems. Majority (47.5%) of the respondents believed that herbal treatment success depended on the nature of the ailment, as against 0.4% that believed otherwise. About 94% of respondents believed that usage of herbs in these communities was widespread. More

males (86.7%) were inclined to the use of herbs than female (13.4%). Respondents (96.5%) accepted that hospitals and health centres were available in these communities. They (81.2%) recognised that the distance of the hospitals and health centres were less than 1km, while 7.5% respondents claimed that the distance was longer than 1km. About 98% respondents claimed that herbal medicine was less expensive. The majority of respondents (91.4%) said that herbal medicine is more effective than orthodox medicine.

Discussion

Attitude to use of herbal medicine

About 83.9% of the indigenes used available herbs to treating their ailments. Despite the availability of orthodox health care facilities, the study population seemed to prefer herbal treatments for their ailments. This agreed with the finding of AvRuskin (2000). In terms of gender and the use of herbs, it was found that the male (62.7%) were most inclined to the use of herbs than female indigenes. This shows that they adhered to their local practice in the treatment of their ailments. Also, to show that indigenous practice taps into the intellectual resources associated with indigenous knowledge, which is not cost-effective, but also relevant and indispensable for environmentally

and ecologically sensitive activity. However, the indigenous practice provides the basis for problem-solving strategies for the indigenous/local communities, especially the poor as seen in the study of the (World Bank, 2002). The survey result showed that more people in age bracket 40-49 make more use of the herbs. It also revealed that their educational attainment did not change their making use of the herbs since more respondents with primary school education were more in number compared to the respondents with non formal education who make use of the herbs. Religious believe has not changed their believe and adherence to the use of herbs.

Reasons for the use of herbal medicine

The survey result shows that their reasons for the treatment option ranges from the nature of the ailments to the previous experience when the herbs were used in treating the ailment. The result also revealed that the herbal treatment option is more effective than hospital medicine (76.9%). The result of the survey also shows that it is less expensive to use herbal treatment than hospital medicine (98%). The result equally revealed that their reasons include that they use herbs to ensure effective and proper healing. This is in relation with

what other researchers found as in (Flavier, 2005). The result also shows that the treatment option yields good result (91.4%). The result shows that they use herbs in treatment of Fertility problems (42.4%). More so, the result shows that that the common ailment in these communities is malaria by 78.5%. The result shows that whenever they have malaria, they make use of the available herbs as the treatment option. These reasons goes to show that indigenous knowledge help communities find the best solution to a development problem by being an appropriate appraisal for development

paradigms being implemented in the continent (World Bank, 2007). This finding is in support of Onah (1995), in Udeno and Isi-Uzo environs of Nsukka that showed that the nature of illness very much determines where to seek for treatment.

Relationship between income and use of herbs

The survey result shows that economic effect on the citizen using the herbal medicine is favourable. The cost of the herbal medicine is low when compared to the hospital medicine by 98%. The practitioners do not charge much money to offer the treatment. They claim that collecting money from the patients will defile the efficacy of the herbs. The respondents in the income bracket of N5, 000-10,000 presents more to the use of herbs and respondents with trading as their occupation by 52.1% and 70.9% respectively. This also shows that indigenous knowledge represents an important component of global knowledge on development issues and helps to leverage other forms of knowledge so that poverty and other ills can be addressed jointly with the poor (World Bank, 2007). This also shows that IK is closely related to survival and subsistence and provides a basis for local-level decision making in various fields of activities (Ayodele, 2003).

This shows that the concept of health care with a focus on cultures has been gaining attention since 1978, at which time the World

Health Organization (WHO, 2003) declared indigenous healing systems to be an important part of the mainstream biomedical health care. Since that time, Nigeria has been of two minds as far as determining the appropriate response. While some Health Ministers and policy bureaucrats have, in various ways, stressed the need to use indigenous health resources, others have considered allowing healers to continue in their traditionally recognized community-caring roles. All of this tells us that indigenous medicine still plays an undeniably important role in Nigeria's approach to health needs and challenges.

The finding from this study is in accordance with (Iroegbu, 2001, 2005) that up to today, 80% of the Nigerian population still relies on indigenous medicine to meet their health-care needs. Health professionals and institutions will, sooner or later, have no choice but to seek a better understanding of who these healers are, and, more particularly, what resources and fields of knowledge they express and represent.

All the same, there is insufficient information and understanding when it comes to Nigeria's indigenous medicine practitioners. Surprisingly, this is the case even in terms of the degree to which people who claim to know and understand what these healers are doing are capable of using their training and expertise to explain the reality of healer function in society (Warren et al, 2005; Brokensha, 2002).

Conclusion

Based on the stipulated facts above, the following conclusions are drawn. The people of the Akpa and Edem-ani Communities of Edem in Nsukka L.G.A, and Awha Imezi and Awha Ndi Agu of Imezi communities in Ezeagu still believe in the indigenous knowledge as regards the health problems. Despite the fact that there are hospitals and health centers within the environment, most of them still prefer the

herbal medicine in treatment of their health problems. The use of herbs in the treatment of a particular ailment depends on its nature and the previous experience of the person or other community members. The cost of using herbal medicine is less expensive to the people when compared to the cost incurred by using medicine from the hospital. The practitioners do not charge much money because they

believe that their ancestors never collected much money from the patients in order to maintain the efficacy of the herbs. This study shows that effective support of the indigenous knowledge will enhance the health system in these areas for good health for all.

Recommendations

The following recommendations are made based on the findings of the study for policy consideration:

- The users of the herbal medicine in these communities should be encouraged by creating awareness of the effectiveness of their Indigenous Knowledge as regards the health need in other communities to benefit from their natural endowment.
- The herbal practitioners should be organized to form an association through which their importance should be felt by many who need their services.
- There are needs to sustain these commendable indigenous health practices in other to continue upholding the cultural practices in these areas.

- There should be data on what herbs that are used for a particular ailment in these areas.
- The challenge for the development community is to find better ways to learn about indigenous institutions and practices and where necessary adapt modern techniques to the local practices.

Since all sorts of medical systems operate with the support of government initiatives and licensing of skills in western countries, healer skills and cultural resources are to be recognized as basic endowments in Nigeria. How long will it take before concrete policy initiatives emerge that will consider Nigeria's health and cultural resources as being as important as the development of her oil resources?

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CHEMICAL EXPLOSIVES: WARHEAD ALLY

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Abstract

Interactions among humans and international communities result in occasional misunderstanding, which may mature into dispute, quarrel, conflict or war. To secure victory, the warhead may inflict damage on the target enemy, mostly by a transfer of mechanical energy, producing shock wave or lethal fragments. This review examines how the warhead may store this energy in form of chemical explosives, which take advantage of exothermic chemical reactions that release energy. It recommends the discouragement of the production and use of chemical explosives in favour of Green Chemistry.

Keywords: *explosive materials; exothermic reactions; detonation*

Introduction

In a world, where no man or nation is an island, human and international relations are indispensable. This is truer for nations in the globalising village, as the entire world has become today. Since people have differences in interests, mental levels and generations, misunderstanding frequently occurs. A mismanaged misunderstanding matures into a dispute. If not carefully handled, a dispute blossoms into a quarrel. Without a wise management, a quarrel is blown into a conflict. And, if not carefully managed, a conflict breaks into a full-blown war. Therefore, misunderstanding needs wise management to forestall dispute, quarrel, conflict and full-blown war (Commander, 1972).

Once a war breaks out, victory is sought desparately with all strength and tact at the fighter's disposal. To secure victory, the main purpose of any warhead is to inflict damage on the target enemy, mostly by a transfer of energy from the former to the latter. Typically, the energy is mechanical in nature and takes the form of a shock wave or the kinetic energy of fragments, both of which must release a large amount of energy. Many warheads store this energy in form of chemical explosives, which take advantage of exothermic chemical ractions that release energy (Army Research Office, 1964).

If the reaction proceeds slowly, the released energy will be dissipated and there will be few noticeable effects other than an increase in temperature. But, if the reaction proceeds very rapidly, the energy will not be dissipated. Thus, a great quantity of energy can be deposited into a relatively small volume. This manifests in a rapid expansion of hot gases, leading to the explosion of the relatively small container. This, in turn, creates a shock wave or propels fragments of the shattered container outwards at high speed. The fragments may kill or blow down objects, such as houses or bridges (Meyer et al, 2007).

Chemical explosive is a destructive device against human life and environment (Eneh, 2011 a,b,c,d; Eneh and Agbazue, 2011; Eneh and Agunwamba, 2011). The literature on chemical explosives is fragmented and disharmonious. This review paper sought to update and harmonise resources on the subject. After this brief introduction, the remainder of the paper is structured as follows: the difference between chemical explosives and other exothermic reactions, chemical explosive materials, classification of explosive materials, barrier and initiation of explosive reactions, chemical explosives and their uses, and implications for development.

The difference between chemical explosives and other exothermic reactions

Chemical explosions may be distinguished from other exothermic reactions by the extreme rapidity of their reactions. In addition to the violent release of energy, chemical explosions must provide a means to transfer the energy into mechanical work. This is accomplished by expanding product gases from the reaction. If no gases are

produced, then the energy will remain in the products as heat. Most chemical explosions involve a limited set of simple exothermic oxidation reactions (reactions with oxygen that release energy) (Urbanski, 2009).

The total amount of energy released in the reaction is called the heat of explosion. It can be calculated as the difference between the heat of formation of reactants and the heat of formation of the products:

$$\Delta E = \Delta E_f(\text{reactants}) - \Delta E_f(\text{products})$$

Table 3.1 shows the heats of formation for the products and many common explosives

(reactants). The heat of explosion is positive for the exothermic reaction.

Table 3.1: Heats of formation

Name (kJ/mol)	Formula	MW (g/mol)	ΔE_f
Carbon monoxide	CO	28	-111.80
Carbon dioxide	CO ₂	44	-393.50
Vapour	H ₂ O	18	-240.60
Nitroglycerin	C ₃ H ₅ N ₃ O ₉	227	-333.66
RDX	C ₃ H ₆ N ₆ O ₆	222	+83.82
HMX	C ₄ H ₈ N ₈ O ₈	296	+104.77
PETN	C ₅ H ₈ N ₄ O ₁₂	316	-514.63
Trinitrotoluene, TNT	C ₇ H ₅ N ₃ O ₆	227	-54.39
TETRYL	C ₇ H ₅ N ₅ O ₈	287	+38.91

Source: fas.org, 2011

Notes:

- 1) CO, CO₂ and H₂O are assumed to be in gaseous form.
- 2) ΔE_f for N₂, H₂, O₂ and all other elements are all zero.

Since most of the energy release comes from oxidation reactions, the amount of oxygen available is a critical factor. If there is insufficient oxygen to react with available carbon and hydrogen, the explosive is considered as oxygen deficient. The converse is considered as oxygen rich. A quantitative measure of this is called the oxygen balance (OB) (Akhavan, 2011).

The strength of the explosive is determined by the conversion of the heat of explosion into mechanical work, which is dependent upon the amount of produced gases available for expansion. In the case of

trinitrotoluene (TNT), 10 moles of gas are produced for each mole of explosive. This fact is exploited in *Berthelot approximation* to predict the relative explosive strength of a material (as compared to TNT on a mass basis) (Yinon and Zitrin, 1996).

The relative explosive strength calculated in this manner is of limited use. What is really important is the actual strength, which can only be measured by experiment. Standard tests mostly involve a direct measurement of the work performed. Examples of measurements for RDX are:

Ballistic mortar test	140 %
Trauzl block test	186 %
Sand crush test	136 %

They all compare favorably with our Berthelot approximation (Fordham, 1980).

Chemical explosive materials

Chemical explosives may be pure chemicals or mixtures. Cooper and Kurowski (1996) identified and listed alphabetically about 82 of them as azides, fulminates, 1'-azobis-1,2,3-triazole, 4-dimethylaminophenylpentazole, acetone peroxide, ammonium azide, and ammonium chlorate. Others are ammonium dinitramide, ammonium nitrate, ammonium permanganate, barium azide, 1,2,4-butanetriol trinitrate, chlorine azide, and copper(I) acetylide. Again, there are copper(II) azide, diacetyl peroxide, diazodinitrophenol, diethylene glycol dinitrate, 4,4'-dinitro-3,3'-diazonofuroxan, 2,4-dinitrotoluene, erythritol tetranitrate, and ethyl azide. Others are ethylene glycol dinitrate, FOX-7, HBT (explosive), heptanitrocubane, hexamethylene triperoxide diamine, hexanitrobenzene, hexanitrodiphenylamine, and hexanitroethane.

Also, there are hexanitrohexaazaisowurtzitane, hexanitrostilbene, HHTDD, HMX, lead styphnate, lead(II) azide, manganese heptoxide, and mannitol hexanitrate. Again, there are methyl azide, methyl nitrate, methylammonium nitrate, mononitrotoluene, nitramex and nitramon explosives, nitrocellulose, nitrogen triiodide, and nitroglycerin. Others are nitroguanidine, nitromethane, nitrostarch, octaazacubane, octanitrocubane, pentaerythritol tetranitrate, pentazenium, and pentazole. Yet others are picric acid, picryl chloride, polyvinyl nitrate, potassium picrate, propylene glycol dinitrate, RDX, silver acetylide, and silver azide (Cooper and Kurowski, 1996).

There are silver nitride, sodium azide, styphnic acid, TATB, tetraazidomethane, tetranitromethane, tetrasulfur tetranitride, and

tetrazene explosive. Again, there are tetryl, tetrytol, 1,3,5-triazido-2,4,6-trinitrobenzene, triethylene glycol dinitrate, trimethylolethane trinitrate, 2,4,6-trinitroaniline, trinitroanisole, and 1,3,5-trinitrobenzene. Yet others are 2,4,6-trinitrobenzenesulfonic acid, trinitrotoluene, trinitrotriazine, 2,4,6-tris(trinitromethyl)-1,3,5-triazine, urea nitrate, and xylitol pentanitrate (Cooper and Kurowski, 1996).

Explosive materials must be highly energetic, as characterized by the relative strength, and must also react violently. The speed of the reaction is vital to the build up of a large amount of energy into a small volume. The rapidity of reaction is called the shattering effect (or potential) or *brisance* (from the French meaning to "break") of the explosion. It is a property of the material and the degree of confinement. If an explosion is restrained initially, it can build up a large pressure and achieve the same effect. The rapidity of the reaction is used as a method of classification of explosive materials (Urbanski, 2009).

Classification of explosive materials

Explosive materials, which react very violently (are brisant) are known as *high explosives*. They are used solely for their destructive power. In contrast, *low explosives* are materials that react more slowly. They release a large amount of energy, but due to the relatively slow rate of reaction the energy is more useful as a propellant where the expansion of the gases is used to move projectiles. An example would be gunpowder. It is true that confinement will increase the brisance of gunpowder, but there is a wide variety of materials that react much more quickly and violently than gunpowder (Fordham, 1980).

Barrier and initiation of explosive reactions

The oxidation reactions that release energy in explosive reactions do not occur spontaneously. There is usually some small barrier that must be overcome by the input of energy that will start the reaction, which then will continue by itself until completion. The input of energy to overcome the barrier is known as initiation (or *detonation*). Sometimes, only mechanical force is required, like in the case of nitroglycerin. Other cases require heat, like from a match or

electricity. The ease of which an explosive may be detonated is its *sensitivity* (Cooper and Kurowski, 1996).

For safety considerations, explosive materials are separated into three categories: those which will detonate easily, called sensitive or *primary explosives*; those which require slightly more energy to detonate, called *intermediate explosives*; and those which require relatively more energy to detonate, called insensitive or *secondary explosives* (Cooper, 2001).

Chemical explosives and their uses

Table 3.2 shows common explosives and their uses.

Table 3.2: Common explosives and their uses

Primary H.E. (detonators)	Intermediate H.E. (boosters)	Secondary H.E. (main charges)
Mercury fulminate	Tetrytol	RDX
Lead azide	PETN	Comp-A,B,C
Lead styphnate	Tetryl	Cyclotol
Tetracene	TNT	HBX-1,3
DDNP		H-6
		MINOL 2
		Ammonium picrate

Source: Fas.org, 2011

Primary explosive materials are used to detonate the entire explosive device. That is, they are usually connected to some external device, which starts the detonation. In this capacity, the primary explosive is called the fuse. The energy from the explosive detonation of the primary material is used to set off the booster which, in turn, sets off the main charge, which is made up of secondary (insensitive material). This combination of a small quantity of sensitive material used to set off a large amount of secondary material is known as the *explosive train*. It is called a train because the events occur in sequence. The main charge must be made up of insensitive material for the safety of those handling the device. In practice, the fuse is rarely stored with the device until it is required for use. In this manner, the device remains relatively safe, since it is only made

up of secondary (insensitive) material and cannot be detonated (Ledgard, 2004).

Once the fuse is installed, the entire device requires great care in handling to prevent inadvertent detonation. Often, the device is configured so that the explosive train must pass through a small physical port that connects the fuse to the main charge. This port can be blocked until the device will be used. As an example, the port may consist of two rotating plates with off-centre holes. When the plates are aligned, the two holes will line up and permit operation. This is called *arming the device*. Otherwise, the holes will not be aligned and the device will be safe. The mechanism with plates is called *the safing and arming device*. Other configurations exist, but they all accomplish the same function: to prevent inadvertent detonation and permit detonation when authorized (Zukas et al, 1998).

Another type of initiation is *deflagration*, in which the decomposition of the explosive material is propagated by a flame front, which moves slowly through the explosive material. Deflagration is a characteristic of low explosive material, such as gunpowder (Yinon and Zitrin, 1996).

Early thermal weapons, such as *Greek fire*, have existed since ancient times. But, the first widely used explosive in warfare and mining was *black powder*, invented in 9th century China. This material was sensitive to water, and evolved lots of dark smoke.

During the 19th century, black powder was replaced by nitroglycerine, nitrocellulose, smokeless powder, dynamite and gelignite (the last two were invented by Alfred Nobel). World War II saw an extensive use of new explosives. In turn, these have largely been replaced by modern explosives, such as TNT. The increased availability of chemicals has allowed the construction of improvised explosive devices (Carlucci, 1986).

Implications for development

Chemical explosives destroy lives and property. They also pollute and destroy the life-sustaining environment. Whatever reasons and benefits they avail cannot justify the damage they occasion. Worse still, the

use of chemical explosives negates sustainable development. Therefore, production and use of chemical explosives ought to be discouraged in favour of Green Chemistry.

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NATURE CONSERVATION FOR ECO-TOURISM: THE CASE OF CERCOPAN, CALABAR, NIGERIA

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Abstract

Man's assiduous efforts to interfere on environment enhance his socio-economic development. These quests, however, throw major challenges, which are underpinned by the threat to the ecosystem. Man and other creatures are invariably the recipients of such negative impacts as climate change, land and water degradation, population pressure, extinction (animals and plants), deforestation, desertification, oil spillage, biodiversity loss and other forms of environmental stresses. This paper reports on the research conducted in 2011 in the Centre for Education, Research and Conservation of Primates and Nature (CERCOPAN), Calabar, Nigeria, which deals with rescued, captured and donated primates. Species were quarantined, nurtured, rehabilitated and sent back to protected wild habitats. Findings showed that the environment can be holistically ameliorated through afforestation and conservation.

Introduction

The quest for man's survival on earth necessitated the forage and acquisition of other necessities of life for his wellbeing and better life. This, however, satisfies or dissatisfies man directly or indirectly with positive or negative impacts. His inherent interferences on earth, no doubt, affect other creatures in the same vein. His acts of alterations in exploitations and explorations in the name of unsustainable development induce major environmental challenges underpinned by the threat to the ecosystems on which the people depend, resulting to population pressure, land and water degradation, deforestation, desertification, biodiversity loss and other forms of environmental stresses.

The consequences of these interferences result in environmental problems, which research must redress for poverty alleviation, improved health conditions and standard of living for the present and future generations. To this end, the Centre for Education, Research and

Conservation of Primates and Nature (CERCOPAN), Calabar, Cross River State, Nigeria, deals with rescued, captured and donated primates. The proactive measures are aimed at achieving high quality level of environmentally friendly ambience towards enhancing attractive eco-tourism, since tourists are increasingly becoming more sophisticated and discerning, expecting "good value" for money in their visits. Testimonial evidence of afforestation and conservation are the booming wildlife eco-tourisms in Kenya, Tanzania and Uganda in East Africa and in Egypt and Algeria in North Africa.

This paper reports on the research conducted in 2011 in CERCOPAN on afforestation and conservation as means of ameliorating the environment. Species were quarantined, nurtured, rehabilitated and sent back to protected wild habitats. Findings showed that the environment can be holistically ameliorated through afforestation and conservation.

Conceptual and theoretical framework

Human Impacts

Homo sapiens have been the cause of many species' extinction. Due to the human propensity to shape and modify the environment for economic development, the habitat of other species often become altered or destroyed. Even before the modern industrial era, human activities were having widespread, catastrophic effects on the environment, such as found in Aboriginal Australians and Australian mega fauna (Miller, 2005). Aboriginal hunting practices, which included burning large sections of forest at a time, eventually altered and changed Australia's vegetation so much that many herbivorous mega fauna species were left with no habitat and were driven into extinction. Once herbivorous mega fauna species became extinct, carnivorous mega fauna species soon followed because the food for the latter had disappeared.

In the recent past, humans have been responsible for causing more extinction within a given period of time than ever before. Deforestation, pollution, anthropogenic climate change and human settlements have all been driving forces in altering or destroying habitats (Barnosky, 2011). The destruction of ecosystems, such as rainforests, has resulted in countless habitats being destroyed. These biodiversity hotspots are home to millions of habitat specialists, which do not exist beyond a tiny area (Myers, 2000). Once their habitat is destroyed, they cease to exist. This destruction has a follow-on effect, as species which coexist or depend upon the existence of other species also become extinct, eventually resulting in the collapse of an entire ecosystem (Brooks, 2002). These time-delayed extinctions are referred to as the extinction debt, which is the result of destroying and fragmenting habitats.

Environmental degradation

Environmental degradation is the deterioration of the environment through

depletion of resources, such as air, water and soil; the destruction of ecosystem and the extinction of wildlife. It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable (Johnson et al, 1997). The United Nations International Strategy for Disaster Reduction defines environmental degradation as "The reduction of the capacity of the environment to meet social and ecological objectives, and needs" (ISDR, 2004).

Environmental degradation is one of the ten threats officially cautioned about by the High Level Threat Panel of the United Nations. The World Resources Institute (WRI), UNEP (the United Nations Environment Programme), UNDP (the United Nations Development Programme) and the World Bank alluded to environmental degradation in the health and environment report made public worldwide on May 1, 1998.

Afforestation

Afforestation is the establishment of a forest or stand of trees in an area where there was no forest (Andrea, 2002). Reforestation is the re-establishment of forest cover, either naturally (by natural seeding, coppice, or root suckers) or artificially (by direct seeding or planting) (Gerrit, 2007). Many governments and non-governmental organizations directly engage in programmes of afforestation to create forests, increase carbon capture and sequestration, and help to anthropogenically improve biodiversity.

In some places, forests need help to re-establish themselves because of environmental factors. For example, in arid zones, once forest cover is destroyed, the land may dry and become inhospitable to new tree growth. Other factors include overgrazing by livestock, especially animals, such as goats, cows, and over-harvesting of forest resources. Together these may lead to desertification and the loss of topsoil.

Without soil, forests cannot grow until the long process of soil creation has been completed - if erosion allows this. In some tropical areas, forest cover removal may result in a duricrust or duripan that effectively seal off the soil to water penetration and root growth. In many areas, reforestation is impossible because people are using the land. In other areas, mechanical breaking up of duripans or duricrusts is necessary, careful and continued watering may be essential, and special protection, such as fencing, may be needed.

In North Africa, the Sahara forest project coupled with the Seawater Greenhouse has been proposed. Some projects have also been launched in some countries, such as Senegal, to reverse desertification. As of 2010, African leaders were discussing the combining of national countries in their continent to increase effectiveness. In addition, other projects, such as the Keita project in Niger, have been launched in the past, and have been able to locally reverse the damage done by desertification (Gerrit, 2007).

Conservation

Natural Habitat

The natural environment is a source for a wide range of resources that can be exploited for economic profit. For example, timber is harvested from forests and clean water is obtained from natural streams. However, land development from anthropogenic economic growth often causes a decline in the ecological integrity of nearby natural habitat. There is economic value in conserving natural habitat. Financial profit can be made from tourist revenue, particularly in the tropics, where species diversity is high. The cost of repairing damaged ecosystems is considered to be much higher than the cost of conserving natural ecosystems (Noidoo, 2005).

Habitat loss

Habitat loss and destruction can occur both naturally and through anthropogenic causes.

Events leading to natural habitat loss include climate change, catastrophic events (such as volcanic explosions) and through the interactions of invasive and non-invasive species. Natural climate change events have previously been the cause of many widespread and large-scale losses in habitat. Previously known warm areas in the tropics (the most sensitive habitats on Earth) grew colder, and areas, such as Australia, developed radically different flora and fauna from those seen before. The mass extinction events have also been linked to sea level changes, indicating that large-scale marine species loss was strongly influenced by loss in marine habitats, particularly shelf habitats (Andrea, 2002).

Habitat conservation

Habitat conservation is a land management practice that seeks to conserve, protect and restore, habitat areas for wild plants and animals, especially conservation reliant species, and prevent their extinction, fragmentation or reduction in range. ("Habitat Conservation", 2009). Habitat conservation is important in maintaining biodiversity, an essential part of global food security. There is evidence to support a trend of accelerating erosion of the genetic resources of agricultural plants and animals (Brooks, 2002). An increase in genetic similarity of agricultural plants and animals means an increased risk of food loss from major epidemics.

Habitat conservation determinant

Determining the size, type and location of habitat to conserve is a complex area of conservation biology. Although difficult to measure and predict, the conservation value of a habitat is often a reflection of the quality (e.g. species abundance and diversity), endangerment of encompassing ecosystems, and spatial distribution of that habitat. Habitat conservation is vital for protecting species and ecological processes. It is important to conserve and protect the space/area in which that species occupies (Hierfl, 2008).

Therefore, areas classified as ‘biodiversity hotspots’, or those in which a flagship, umbrella, or endangered species inhabits are often the habitats that are given precedence over others. Species that possess an elevated risk of extinction are given the highest priority, and as a result of conserving their habitat, other species in that community are protected, thus serving as an element of gap analysis.

Wild life conservation

Wildlife conservation is the preservation, protection, or restoration of wildlife and their environment, especially in relation to endangered and vulnerable species. All living non-domesticated animals, even if bred, hatched or born in captivity, are considered wild animals.

Wildlife represents all the non-cultivated and non-domesticated animals living in their natural habitats. Our world has many unique and rare animals, birds and reptiles. However, the pressure of growing population in different parts of the world has led to the increasing need of using land for human habitations and agriculture. This has led to the reduced habitat of many wild animals.

The major threats to wildlife can be categorized as:

- *Habitat loss*: Fewer natural wildlife habitat areas remain each year. Moreover, the habitat that remains has often been degraded to bear little resemblance to the natural wild areas which existed in the past.
- *Climate change*: Because many types of plants and animals have specific habitat requirements, climate change could cause disastrous loss of wildlife species. A slight drop or rise in average rainfall will translate into large seasonal changes. Hibernating mammals, reptiles, amphibians and insects are harmed and disturbed. Plants and wildlife are sensitive to moisture change so, they will be

harmed by any change in the moisture level.

- *Pesticides and toxic chemicals*: Pesticides are deliberately spread to make the environment toxic to certain plants, insects, and rodents, so it should not be surprising that other plants and wildlife are deliberately harmed at the same time. In addition many chemical pollutants are toxic to wildlife, such as PCBs, mercury, petroleum by-products, solvents, antifreeze, etc.
- *Hunting and poaching*: Unregulated hunting and poaching causes a major threat to wildlife. Along with this, mismanagement of forest department and forest guards triggers this problem.
- *Natural phenomena*: Floods, earthquakes, volcanoes, lightning, forest fires.
- *Pollution*: Pollutants released into the environment are ingested by a wide variety of organisms.
- *Over-exploitation of resources*: Exploitation of wild populations for food has resulted in population crashes (over-fishing, for example).
- *Accidental deaths*: Car hits, window collisions (birds), collisions with ships (whales).

The Conservation Movement

For much of human history, nature had been seen as a resource, one that could be controlled and used for personal and economic gain. The idea was that plants only existed to feed animals and animals only existed to feed man (Thomas et al, 1983). The land itself had limited value only extending to the resources it could provide, such as minerals and oil. Throughout the 18th and 19th centuries, social views started to change and in 1872 the world’s first national park, the Yellowstone National Park in the United States of America, was declared (Haines et al, 1996). After that official conservation movement began.

Rather than focusing on the economic or material benefits associated with nature, humans began to appreciate the value in the nature itself and the need to protect pristine wilderness.

By the middle of the 20th century countries such as the United States, Canada, and Britain understood this appreciation and instigated laws and legislation in order to ensure that the most fragile and beautiful environments would be protected for generations to come. Today with the help of NGO's, not-for profit organizations and governments world-wide there is a stronger movement taking place, with a deeper understanding of habitat conservation with the aim of protecting delicate habitats and preserving biodiversity on a global scale.

The Nature Conservancy and CERCOPAN

Since its formation in 1951 The Nature Conservancy has slowly developed into one of the world's largest conservation organizations. It is currently operating in over 30 countries, across 5 continents world-wide. The Nature Conservancy currently has a large number of diverse projects in operation. They work with countries around the world to protect forests, wildlife, river systems, oceans, deserts and grasslands. In all cases the aim is to provide a sustainable environment for both the plant and animal life forms that depend on them as well as all future generations to come. This is the case of Centre for Education, Research and Conservation of Primate and Nature (CERCOPAN) in Calabar, Nigeria, which preserves and conserves primates threatened by extinction. Founded in 1995 by Canadian Zena Tooze, CERCOPAN is now one of the leading environmental non-profit, non-government organizations working for conservation in Cross River State, Nigeria, with excellent relationships with governments at both state and federal levels, and with a support organization in the United Kingdom.

Its primary areas of work are primate rehabilitation, environmental education, community rainforest conservation, and

research. CERCOPAN has two sites, its administrative and primate rehabilitation headquarters in Calabar, and international research and education centre at Rhoko, Iko Esai (their community partners). Partners include the Cross River State Forestry Commission, the Cross River National Park and the University of Calabar.

The forests of this biodiversity 'hotspot' where CERCOPAN works is known as the Cameroon faunal region, and includes the area east of the Cross River and south west Cameroon. The primate community of this region is particularly rich with over a dozen indigenous species. Together with the area of the Niger Delta west of the Cross River, some of the most endangered primates in Africa are found there. These include the Slater's guenon (*Cercopithecus sclateri*), Red-eared guenon (*Cercopithecus erythrotis*), Drill monkey (*Mandrillus leucophaeus*), and the red-capped mangabey (*Cercocebus torquatus*). Other species include the Mona guenon (*Cercopithecus Mona*), the putty nosed guenon (*Cercopithecus nictitans ludio*), the crowned guenon (*Cercopithecus pogonias*), Preuss' red colobus (*Procolobus preussi*) and several prosimians. Further north, there are also savannah species, *Cercopithecus tantalus* and *Erythrocebus patas*. Many of these species coexist in the same primate communities, often forming mixed species assemblages for feeding and resting. Some details of these species are given below.

CERCOPAN considers education a priority, and has welcomed visitors from the beginning. It has a dynamic education programme in both Calabar and Rhoko. Without an extensive education programme, all efforts towards conservation and rehabilitation of primates would be in vain. The hope for the future of Africa's wildlife is with the young people of today being educated on environmental conservation. Resources are very scarce, and young Nigerians need exposure to the wonders of nature and animal behaviour - something that is taken for granted in Nigeria's culture.

Entrance to the Calabar centre is free, and full time education staff has been part of CERCOPAN's programme for the past 8 years. This allows an active outreach programme as well as escorted visits. All visitors to CERCOPAN in Calabar are escorted on a conducted tour of the project. CERCOPAN's goals of forest and primate conservation are explained, and questions and discussion invited. All primate care staff is trained to escort visitors, and they take a participatory approach to learning as much as possible.

CERCOPAN takes pride in education programme, and every year in Calabar alone they welcome over 30,000 visitors annually, including primary, secondary and university students and the general public. It also celebrates World Environment Day (June) in style, where the secondary school students participating in the outreach programme come together to parade through Calabar streets.

Tourism

As the global tourism industry has expanded, clients are becoming more sophisticated and discerning, expecting good 'value for money' in their travels. Another important trend is that more tourists are wishing to participate in recreational and cultural activities. Many are also environmentally conscious, and wish to visit destinations that exhibit a high level of environmental quality, and with environmentally friendly facilities and services. Special interests in tourism, such as eco-, cultural and adventure tourism, is also gaining in popularity, and destinations offering special interest features are attracting these emerging tourist markets. In this regard, many countries of the world are grappling with the associated problems posed by development and industrization, and working towards ensuring liveability and sustainability to enhance tourism.

Tourism and wildlife

Ecotourism is often more than just organized tour of natural sites. It is a purposeful travel to natural areas with a view to understanding

the culture and natural history of the environment. The act should be performed without alteration of the integrity of the ecosystem while producing economic opportunities that make the conservation of natural resources beneficial to the local community. Tourism however is not fully developed in Africa as it is in the developed countries of the world. Wonders of the wild nature are part of the wealth of Africa and of mankind which the world cannot afford to ignore. Some parts of Africa have become popular tourist centres; such is the case with East Africa of (Kenya, Tanzania and Uganda), North West Africa, South and North Africa. East Africa scores high because it has a lot of sunlight throughout the year and this arouse interest in the people from colder regions especially during winter season ([UNEP-WCMC http://parks.it](http://parks.it)).

In East Africa, tourism is best developed in Kenya where the number of tourist increased from 6,000 in 1952 to 328,000 in 1972 and it is estimated that one lion is worth 7,000 US dollars annually.

In Tanzania and Uganda the inflow is lesser. For example L.Nakudu National Park is noted for birds such as flamingo. Malindi and Watamu Marine National Parks are noted for their beautiful coral reefs where over 200species of fish can be seen in the clear waters. Serengeti National Park and Ngorongro in Tanzania, while Uganda, Kabelega and Ruwenzori National Parks offer numerous Tourist attractions. Earnings from ecotourism in Kenya and Tanzania dwarf that of coffee.

In West Africa, it is not yet significant although some countries like Gambia, Ivory Coast, Senegal and Nigeria are trying to build more and improve the existing tourist industries. In Ivory Coast, Senegal and Gambia, the attractions are their beaches for swimming, water skiing, surf riding and sailing.

In Southern Africa, Ethosa National Park of Namibia with some 50,000 big mammals roaming in the wilderness of South Western Africa is worthy of mention as tourist industry.

North Africa is not to be left out in tourist industries especially Algeria and Egypt for their national park with abundant wildlife and

Museums where the oldest pyramid constructed in the world was preserved([UNEP-WCMC http://parks.it](http://parks.it)).

Methodology

Quarantine and rehabilitation

Species were quarantined, nurtured, rehabilitated and sent back to protected wild habitats. Once a newly arrived primate has cleared all tests during a rigorous 3 month quarantine period, the process of social rehabilitation began. First, individuals must learn to become part of a group with their own species. Some took up to a year before

they were fully versed in the social behaviours required of normally functioning members of a dynamic social group. Others, particularly young animals, adapted within days, soon forgetting their human surrogate families. Daily behavioural monitoring evaluated the progress of individuals and changes in dominance hierarchy, as well as facilitated early identification of any illness.

Findings

Afforestation and conservation resulted in holistic amelioration of the environment, thereby enhancing tourism, as well as poverty

alleviation, restoration of biodiversity, improved health and standard of living.

Recommendations

The hope for the future of African wildlife rests on the present generation with the youths as the links of the present and the future. Education geared towards reservation and conservation is pertinent to avoid wildlife extinction; particularly animals and medicinal plants. To achieve environmental friendly sustainable development and habitable ambience for all creatures, the following are recommended:

1. Giving value to nature and forest.
2. Increasing the awareness of local communities on the benefits associated with wildlife conservation and dangers of wildlife extinction.
3. Empowerment of wildlife host community through partnership participation towards discouragement against bush burning, hunting and

poaching for food and commercial purposes.

4. Practical involvement of all citizenry in green environment programmes through guidance and financial inducement in form of grants by government at all levels through non-governmental organizations and association such as Nigerian Environmental Society (NES) and others.
5. Injecting relevant environmental courses in curricula of primary, secondary and tertiary levels and making them compulsory. This will aid in cultural inculcating and cultivation of youths towards environmental reservation and conservation.

Conclusion

World endangered species are nearing extinction and the future generation would be left with illusions and imaginations. Awareness of the dangers of environmental degradation and benefits of environmental

reservation and conservation stand as the practical tools in achieving environmental friendly sustainable development and habitable ambient for all creatures.

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LINKING THE OIL AND GAS INDUSTRY WITH DOMESTIC ECONOMY: AN APPRAISAL OF THE LOCAL CONTENT MANAGEMENT DEVELOPMENT POLICY IMPLEMENTATION

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Abstract

Nigeria's development is still sluggish, the nascent democracy notwithstanding. It behoves theoreticians and practitioners to chart the way forward. This review study appraises the implementation of the Local Content Policy recently introduced by the Government to effect positive changes in the oil and gas sector. Findings show that the implementation is yet to meet the expectations, even though the present government at the centre is determined to deliver.

Introduction

Following the discovery of petroleum in Oloibiri in the present Bayelsa State in 1956 and its subsequent commercial exploration in 1957, Nigerians shifted emphasis on economic activities from agriculture to crude oil, as petroleum became the chief source of Nigeria's national income. Thus, the production of groundnut pyramid in north, cocoa in the west and the palm produce in the east have all dwindled. Worse still, oil exploration activities have ruined the farmland in the Niger Delta region of the country, leaving the people with no alternative than desertion of the farmland in the region (Ugwu, 2009).

Of greater concern is that the domestic economy is crowded out from the crude oil and gas production, leading partially to dwindling fortunes of citizens in the local places of crude oil extraction. Nigerian youth are disenfranchised from the oil activities, which displaced the traditional agriculture, which not only witnesses very low output on the fouled farmland, but also volatile prices in domestic and international markets. Food security has, therefore, become farce.

The oil boom in the 1970s consolidated the systematic and gradual disenfranchisement from the natural resource endowment. Nigeria's oil reserves are the ninth in the world. According to Reuters (2011), "Nigerian crude oil is similar in some respects to Libyan grades and have been attracting strong interest from oil companies unable to load crude oil from the North African producer due to the uprising against Libyan Muammar Gaddafi". The CBN (2004) submitted that the Nigeria's crude, known as the Bonny Light, attracted a very high price premium and was in heavy demand outside the shores of Nigeria.

A lot has been written on the factors responsible for the disconnect of the oil and gas sector from the domestic economy, but little, if any, on the working of the Local Content Development Management Policy of the Federal Government of Nigeria, which sought to address the disconnect. This review sought to analyze the implementation of the policy thrust aimed at enhancing productivity in oil and gas sector within the domestic front. After this brief introduction, the remainder of the paper is structured as follows: conceptual issues and challenges,

which discusses the resource curse theory as it applies to Nigeria, the Nigeria's local content policy, systemic challenges, the capital-intensive and sophisticated technology-driven Nigerian oil and gas sector, and the development reforms; local content administration and challenges, which looks at the issues of quality standards, skills, competence, funding, infrastructure, and

legislative framework; effects of local content development management policy implementation on Nigerian economy, which examines linkages, education, pricing system, medical facilities, tax, entrepreneurship, and social; the structure on ground at the Petroleum Training Institute; findings; capabilities; support from joint venture companies; and conclusion.

Conceptual issues and challenges

Resource curse theory

According Perkins et al (2001: 643): "Booming Primary exports may fail to stimulate development for another more pervasive reason, which has been labeled Dutch Disease". The oil boom of 1970s and early 1980s produced similar paradoxes in some other countries of the world. While other countries learnt from their past mistakes, Nigeria has continually failed to learn from the errors of past leaders. Rather, Nigerian leaders seem to be experts at replicating the mistakes of their past leaders. This has been the bane of economic development in Nigeria.

Ahmed (2008: 29) posited that:

While Nigeria has been an oil and gas producing country for over 50 years, it is obvious that beyond collecting crude sales revenue and related taxes, Nigeria is at best a peripheral player in the industry, which is inconsistent with the present trends in major oil producing nations in South America, Middle East and Asia.

The Nigerian (Local) Content Development Policy was conceived for implementation and enforcement, in order to make the expected strategic contributions in areas of economic and social development. As is the case with many impeccable policies in Nigeria, poor implementation and enforcement may lead to failure in actualising its objectives. Consequently, social malaise may continue to increase (Eneh, 2011a).

Local content policy

Local content, as defined in connection with the extractive industry, is the quantum of value added or created in a country's economy through a deliberate utilization of local human and material resources and services in the exploration, development, exploitation, transportation, marketing and sale of the country's crude oil and gas resources without compromising quality, health, safety and environmental standards. This type of business obviously would require joint venture partnerships with foreign experts as technical partners. The desired change would be in the area of ownership structure. The Nigerian Organized Private Sector (OPS) specialized in the field of oil exploration and production should bring in and partner with the technical expertriates in the processing of supplies and training the right caliber of personnel for effectiveness.

Ahmed (2008: 30) recalled that:

The Nigerian government, in an attempt to correct the huge capital flight in the strategic oil and gas sector, under a Nigerian content development policy developed in 2004, issued a set of directives in March 2005, to the extractive industry operators.

The directives sought to promote utilization of labour and materials that are produced within the domestic economy. This meant the prohibition against new joint venture projects that do not substantially benefit Nigerians and indigenous companies.

The essence of Local Content Management Policy is not doing away with the non-indigenous personnel in the industry, but that the foreign partners should integrate local companies in their oil and gas activities, to the point of 50:50 terms enacted into the Act through a bill in 2010, as the only way to stimulate and create proper linkages of the oil and gas sector with the rest of the economic sector within the domestic market. This would create employment and pave way for the total privatization of the crude petroleum industry.

The Nigerian National Petroleum Corporation (NNPC), or better still another corporation, may serve as a melting pot between the oil companies and the local content suppliers. The effective implementation of the local content initiative is a *sine qua non* and a prescribed leverage and necessary structure for the deregulation of the oil and gas sector of the petroleum industry. The impact of the crude oil sector is not preponderantly noticeable in all the component parts of the domestic economy due to the insignificant linkages of the sector with the rest of the economy. It is unfortunate that the impact of the sector is only felt in all aspects of the domestic economy when the rising petroleum product prices are transmitted into the prices of all other products in the domestic market.

Systemic challenges

There are certain structural barricades that have always short-changed government's programmes and projects (Eneh, 2011b). For instance, rather than being complementary, the asymmetrical multi-ethnic differences in the Nigerian polity are diametrical and the major causes of development programme and project failures. In addition to replication of errors made by predecessors, other challenges that seem to be structurally endemic in the political leadership of the country include the placement of a square peg in a round hole, and an entrenched profligate lifestyle in the political leadership.

Tokumboh (2000: 53) stated that "One important factor giving rise to

maladministration is the employment of incompetent staff, particularly to management and sensitive positions. This was the situation at the early stages in many public corporations." This is a typical example placing round pegs in square holes, which renders the ministries, departments and agencies (MDAs) dysfunctional, a mistake repeated by successive leaders in Nigeria. Even the high level of cognitive learning could not redress some of these structural defects.

Owolabi (2007: 11) posited that:

Economically, misallocation of resources is worsened by corruption, and government officials will not press for changes in the regulations from which they enrich themselves. In fact, officials may press for more of such regulations and license procedures hoping for more bribes.

Corruption is an anti-development phenomenon, which aggravates income inequalities and poverty. Those who benefit from bribery, kick backs and preferential deals are not likely to be among the poorest. Corruption adversely affects economic growth, as it acts as additional monetary tax on companies, raises costs and discourages investment. Informal payments on public projects may be twice their actual cost. These are some of the reasons why government interventions and control introduces inefficiencies, in line with the neo-classical model of economic development, which asserts that any government intervention in the economy is distortionary and counter-productive. Again, also opposed to government intervention are the New Political Economy Approach and Public-choice Theory, which argue that government can do nothing right, but politicians, bureaucrats, citizens, and states act solely from a self-interested perspective, using their power and the authority of government for their own selfish ends. Corruption exerts pressure on prices within the domestic market.

In this way, it exacerbates the incidence of poverty and complicates operation of fiscal and monetary policies, thereby making them less fruitful, especially on the rising price levels. The private sector, which is judicious in the utilization of resources, is therefore, preferable as a market economy.

Capital-intensive and sophisticated technology-driven oil and gas sector

The crude oil and gas sector is capital-intensive and sophisticated technology-driven. But, to imagine that over 50 years after the commencement of oil production in Nigeria, virtually every input is sourced from overseas, leaves a lot to be desired. The situation needs to be addressed by way of aligning the thoughts of and co-opting in proper manner the multinational oil companies, who feel reluctant to embrace the local content concept because of fear of being dispossessed of their various offshore procurement offices. There is the need for a compromise or trade-offs on both sides, especially as Nigeria's rate of capital formation is very slow, according to CBN (1995).

The essence of capital formation is to be prudent and conservative in consumption expenditures in order to leave surplus balances for investment in the future (Jhingan, 2007). Although, this is the essence of Sovereign Wealth Fund, it is reluctantly embraced by Nigerian successive administrations. A situation in which about 80% of the total federally collected revenue goes into recurrent expenditures is an aberration working against capital formation. However, the 2012 budget has a shocking reversal of the trend to cut the deficit budget to 2.77% of the GDP (from the 2.97% in 2011 budget). This is a heart-warming initiative of the present administration.

The development reforms

Initially, levels of acceptance or support for the local content policy varied from one joint venture operator to another, and have been generally very low. While some were willing

to accept the policy, others were reluctant, as they saw local content as taking away the business of their various off-shore procurement offices. According to Ahmed (2008:30), despite all efforts and publicity given to Nigerian local content policy, especially with regard to the establishment of local content division within the Nigerian National Petroleum Corporation (NNPC), the placement of work orders with Nigerian companies is yet to materialize at significant levels. Some upstream oil companies are reluctant to accept Nigerian content directives issued by the NNPC, and perhaps hope that this will be one of those initiatives that will soon collapse.

The Nigerian Content Development Monitoring Board (NCDMB) was established to perform the following roles:

- Opening the Oil and Gas industry to involve the Nigerian people;
- Cementing access to Oil fields for higher productivity;
- Building capabilities in Nigeria to support increased investment in the industry.

It is expected that these roles will be expanded as new occasions or circumstance that may warrant expansion of roles emerge.

The Local Content Development Act 2010 has gradually started to garner the support and recognition of major stakeholders in the Oil and Gas Industry. For example, Shell Global has adopted Nigeria's local content model, unlike three years ago, when some upstream oil companies were reluctant to accept Nigeria local content directives issued by NNPC (Ahmed, 2008).

In another development, the management of Integrated Logistics Service Nigeria Limited (INTELS) teamed up with the NCDMB in collaboration with the Onne Oil and Gas Free Zone, a type of emporium which show-cased many of the industry stakeholders at Port Harcourt, Rivers State. The conference, which was tagged "First Practical Nigerian Content

Conference,” was an opportunity for in-country capacity building, through the present administration’s implementation imperative (Obi, 2011).

Since Oil and Gas is occupying a strategic position in the overall corporate interest and existence of Nigeria, the whole country will be at a very high risk, if the objective of the local content policy to streamline the local content initiative for adequate linkage with the agricultural sector in particular and the domestic economy as a whole, fails. The Extractive Industries Transparency Initiative (EITI, 2010) submitted that the Crude Oil and Gas sector accounts for over 95% of the annual export proceeds and over 80% of federal government revenue. However, it contributes marginally (40%) to the Gross Domestic Product (GDP). The low contribution of Oil and Gas industry to GDP was corroborated in CBN (2004), which reported the Non-Oil (GDP) contributions as 67.55, 67.35, 70.25, 66.56 and 67.44% for 2000, 2001, 2002, 2003 and 2004 respectively.

The low GDP contribution from the Oil and Gas sector has been traced by experts to the absence of the Local Content Act. Now that the Act is in place, the onus is on all stakeholders to play their roles creditably to ensure that the primary objective of the Act to create employment is achieved. When the productivity of the Oil and Gas Sector within the domestic economy is increased, then its GDP contribution would also be increased.

Ideh (2003) in Briggs (2008: 25) opined that “The Loss of opportunity in the days of plenty to establish an industrial foundation and afford the nation an earlier technological take off ...” is an opportunity now re-appearing as a second chance to Nigeria in the guise of Local Content Act 2010.

Local content administration and challenges

The promotion of Nigerian involvement in Oil and Gas industry is a fundamental national economic and security issue, and its

implementation is imperative. It is thus, critical that the NCDMB’s strategies for Oil and Gas industry operations in Nigeria should address and reflect this fundamental issue of increasing local content value-added in terms of quality without compromising international standards, as well as domiciliation of industry skills and technology. As a matter of fact, the NCDM may have to contend with a number of issues, as follows:

Adhering to high quality standards

Ultimately, businesses are managed and sustained by a combination of product capability (inferior product shall not be accepted) and prices should be competitive enough. The petroleum industry is an international industry; hence Nigerian companies must learn and seek to develop world-class capabilities and recognition through knowledge acquisition and acquaintance with the Local Content Act requirements strategies for quick and easy integration of Nigerians into the Oil and Gas Industry.

Investment in skill and technical know-how

Presently, Nigeria is in the dearth of competent engineering and technical skills to support the Local Content delivery. In the short-run, external technical partners may need to be sought, pending future adjustment through restructuring the educational curricula to mainstream crude oil and gas and allied classroom and practical training. Experience has shown that Asian and East Europe countries have educational curricula that offer skills that are comparably competitive and more cost-effective than similar skills available from Western Europe and North America. The Petroleum Training Institute (PTI), Effurun may not be able to cope with the skill acquisition training demands of the industry. Nigerian staff in the oil and gas sector may be sent abroad for training and competitive compensation, which is critical to employee overall performance and skill retention.

The federal government may have to acquiesce in the establishment of more Training Centres under the supervision of the PTI.

PTI is also expected to establish, for the purpose of achieving the local content objectives, partnership with other oil and gas companies, the type of relationship reminiscent of that existing between law schools and universities, the Institute with Brass Liquefied Natural Gas (Brass LNG), Shell Petroleum Development Company (SPDC) and Ondo State Oil Producing Development Commission (OSOPADEC), Akure. The curriculum development should encourage students of the local content in the areas of purchasing and supply and in the knowledge of how to prepare quotations and contract pricing in line with the oil and Gas sector of the extractive industries. Besides, there is the need to train the trainer. The inadequacy of lecturers in the fields of Crude Oil and Gas may hamper the short-term capability of Nigerian institutions, and needs to be addressed as well.

Commercial competence

Business relationship can only be sustainable in long-term, if and only if they are profitable. Engineering excellence only makes sense in the context of commercial viability. The essential commercial aspect here is contract pricing, payment terms, procurement of materials, and commitment to sensible and practical delivery schedules.

The 50:50 Nigerian Content requirements means the capability of Nigerians performing at the same levels as the foreign companies who have been in the business all these years (over 50 years). This has to be worked at, as these foreigners have acquired the experience and commercial competence required, but Nigeria is just about to start.

Capitalization and funding

Successful implementation of the Nigerian Content Act 2010 requires significant capital formation for re-investment into world-class

manufacturing of oil field materials or consumables and a robust working capital to sustain operations. The business leaders in the local content companies must possess the maturity, experience and the will to accommodate broad shareholding, since the level of funding required will not allow the typical family company mentality.

Infrastructures

The local content development policy concept can only succeed if government and the private sector put in place adequate infrastructural facilities and the enabling environment, particularly in the areas of transportation, power and special and affordable training schools, for the desired technical and manpower development. Since the independence in 1960, Nigeria's educational system has unwittingly shied away from equipping technically inclined tertiary institutions. This has to change, if the "implementation imperatives" of the present administration will succeed in bringing to fruition the objectives of the Nigerian Content Law in order to checkmate capital flight and create employment within the domestic economy.

Legislative framework

There is the need to formulate from time to time adequate legislative framework to nurture and protect the local content companies and prevent the policy from collapsing half-way.

Effects of Local Content Development Management Policy Implementation on Nigerian Economy

Nigerians would reap enormous benefits from the effective implementation of the Local Content Development Management Policy, especially in the area of employment generation to result from sourcing of the materials or consumables with value-adding process that calls for the employment of workers within the domestic front.

The oil and gas sector generates series of economic activities which stimulate demand in material inputs, such as chemical powders and liquids that may or may not be produced locally. The process of producing or procuring these inputs which are critical to oil exploration and drilling requires the engagement of labour. Consequently, we shall discuss the employment creation in the form of linkage of the crude oil sector with the various economic units in the host country.

Linkage effects

Perkins et al (2001: 628) asserted that:

Another potential benefit from primary product export is the possibility of stimulating from production in other related sectors. Indeed, the very notion of export-led growth implies that exports would lead to more broad-based economic growth.

The possible linkages may be upstream (forward linkage) or downstream (backward linkage) industries, increased production of consumer goods, enhanced infrastructure, more widely available skilled labour, and increased government revenues.

For over 50 years of oil production, Nigeria has witnessed retarded development resulting from the failure of the Oil and Gas industry to properly link up with the rest of the country, in particular the agricultural sector. With the agriculture sector employing about 70 percent from the labour market and about 42 percent contribution to GDP, the adequate linkage with this all-important international primary export commodity would place Nigeria on the long-wait path to industrialization. What is now required is for the stakeholders to work as a team with common national interest to bring the dreams of the national integration and development through the local content management policy to fruition.

Educational Effects

The Oil and Gas sector of the extractive industries is sophisticated technology-driven. The training workload in the PTI, Effurun, may expand in terms of increased curriculum content in the areas of purchasing, supply and stores management. The course contents may be increased to also include the different types of consumables (materials) that are majorly used in the oil and gas business, as well as the inclusion of how to prepare viability and feasibility studies, the contract pricing techniques and format, and how to ultimately meet delivery schedules. The nature of the industry may not be business as usual in the orientation of a typical civil service delivery, but essentially differs in all ramifications, as world-class standards must be met.

The educational workload may also need to be extended into existing tertiary institutions, including the polytechnics and universities of science and technology. The foreign technical partners (FTP) may opt for opening more training schools to improve the skills of local personnel.

Effects on pricing system

The local content monitoring policy, when completely implemented and institutionalized, may lead to market oriented pricing system that may spill-over to other-related markets in the domestic economy. If the roles of the foreigners are properly integrated into the policy, the effects of corruption in bloating contract prices may be minimized, since it would not be under the control and influence of corrupt bureaucrats.

Effects on medical facilities

There is a high tendency that medical services will increase in terms of number and quality as incomes increase and the oil companies may have their own clinics with better facilities and world-class services. The expatriate may not seek to patronize local medical services due to the preponderance of fake drugs in most patent medicine shops.

Effects on tax revenue

The state government revenue will increase, as many firms registered as suppliers under the local content initiative would pay taxes on their taxable revenues. Documents showing evidence of payment of taxes may have to be part of the documentations necessary for each year's contract renewal, an oversight function of the NCDMB.

Entrepreneurial opportunity effects

Many small and medium sized firms would emerge as the number of suppliers to oil and gas industry increases. Young graduates interested in acquiring knowledge and skills on how to service the crude petroleum industry may be employed in the registered firms or enter into the main supply chain.

Social effects

The local content may serve as a tranquilizer to the already overheated social environment due to the youth restiveness. The Nigerian content initiative of oil and gas sector of the extractive industries would, no doubt, create many opportunities for employment. This may keep some of the employed youths very busy in the oil well locations and no more time for any form of social malaise. When the youths are idle, they create more trouble, since an idle mind, they say, is the devil's workshop. Depending on the type of market that may emerge, if it is open to entry and competitiveness, the impact would be felt all over the country and activities of the Yahoo boys (scammers) may be reduced drastically.

Petroleum Training Institute (PTI): Structure on ground

Recommendations

While the conception of mainstreaming Nigerians into the Oil and Gas Sector, it noteworthy that certain critical issues need to be resolved:

- Preparing Nigerian educational system to meet up with the training

According to the Petroleum Training Institute (PTI) (www.ptinigeria.org, 2011):

The Petroleum Training Institute (PTI) where our objective is to deliver quality education and provide efficient technological man-power to build a competent and committed workforce that will sustain and service the continental oil and gas industry. The institute is also poised to become the best in using state-of-the-art information technology infrastructure for effective service delivery.

The PTI was not fashioned *ab initio* toward Nigerian content policy. PTI may have to upgrade and establish more outlets for clearing and perfection of technically and technologically trained graduates. The errors of over-ambitions of our past leaders by thinking and believing that technically trained persons, who may even have better chances of being employed into the oil and gas industry, are inferior to university graduates, who though are degree holders, may have slim chances of employment in the industry of our focus, is a travesty of knowledge and learning. The government's sympathy for the teeming unemployed graduates can only be justified through repositioning the technically inclined graduates into their proper place in the Nigerian polity. The hope of enlisting Nigeria among the comity of industrialised nations may be realised through effective implementation implementation of the local content initiative.

capabilities for world-class standard in the Oil and Gas industry.

- The school curriculum needs to be adjusted to make for the technical and technological development needs of the industry.

- Teachers/instructors/trainer need studies.
training to handle the crude petroleum

Conclusion

The policy decision to link the Oil and Gas Industry with the domestic economy is a *sine qua non* for the long awaited industrial take-off in Nigeria. However, the lacuna in the institutional structures may impinge on the sustainability of the policy. Although, the present government drive is quite promising and plausible in fast-tracking the

development reforms in the downstream Oil and Gas Sector, there is the dire need to restructure and reform the educational typology in cognizance of the hitherto relegated technical and technological education. Nigeria needs the type of will-power the Asia Tigers employed for reformation and transformation.

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COMPARATIVE ANALYSIS OF RESIDENTIAL HOUSING ENVIRONMENTAL QUALITY OF DIFFERENT DENSITY AREAS OF ENUGU METROPOLIS

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Abstract

This study investigated the residential housing environmental quality status of low, medium and high density neighbourhoods of Enugu metropolis. Questionnaires were used to collect data, while field tests were carried out to determine the noise level, as well as the air quality in the area. The analysis of variance was used to compare the environmental quality among the different density areas. Findings reveal that different residential density areas have different environmental quality values. High density areas have higher quality than medium density areas. Recommendations include strict adherence to and enforcement of the law of zoning in the development of the area and proper public enlightenment to educate the residents of the area on appropriate disposal of wastes.

Introduction

Concern for the environment exists both in the rural and urban settings. The concern for urban environment is taking alarming dimension because rapid urban population growth, among other factors, have compounded urban environmental quality.

In Enugu metropolis, an increasing number of shanties have been springing up particularly at the outskirts. These include those of Ugbo Odogwu, Nkpologwu, Ugwu Fred, and Ugwu Aaron. Besides, some flats in the metropolis meant to be occupied by single households are now being shared by two or more households. Consequently, the rate of facilities/amenities breakdown in the

metropolis is on the increase, as well as rising volume of wastes and littering on most streets within the metropolis.

The implications of the above situations are numerous and pose enormous challenges to the quality of the residential environment of the metropolis. This study was, therefore, aimed at comparatively analyzing the residential environmental quality of Enugu metropolis. The null hypothesis tested is: the housing environmental quality does not differ significantly among the low, medium and high density areas of Enugu metropolis.

Literature review

Cendrero and Fisher (1999) studied in Florida the procedures for assessing the environmental quality of coastal areas, based on the identification of series of characteristics which can be used to describe different environmental components using certain indicators. Hence, numerical indices, which can be used to assess different qualities on the basis of the indicators, were

proposed. Perz (2011) emphasized that deforestation is not the only issue of importance concurring changes in environmental quantity of the Brazilian Amazon. Using Europe and America as case studies, Cendrero et al (2003) carried out a study on the procedures for sustainability assessment in coastal areas, based on a number of indicators and indices that reflect

environmental quality. The procedure offered the possibility of expressing environmental quality of the coastal areas in numerical form through the use of indices based on clear and replicable method, using indicators that can be measured or objectively determined.

Bernauer and Koubi (2004) assessed the effects of various political variables, such as the type of the political system, the type of democratic government, civil liberties and labour union strength on environmental quality, taking into account the effects of the economic variables. Emerging from the result was the indication that higher income, higher intensity of economic activity and greater trade openness contribute to lower pollution levels in Zurich. Assessing the inequality in the spatial distribution of accessibility and environmental quality in Paris metropolitan region. Palma et al (2007) asserted that local amenities are generally capitalized into housing market. The empirical analysis of the study showed that considerable inequality existed in the spatial distribution of the local amenities and social indicators. The study provided evidence that some amenities (e.g. noise) were much more inequitably distributed than others.

Alkay (2009) carried out a study on the relationship between environmental quality level and housing sale prices in Istanbul metropolitan area of Turkey. The result indicated that the weights of dwelling indicators and satisfaction from housing environment indicators were positive, while the economic, social and accessibility indicators were negative for the casual factor that explained the environmental quality at district level in the metropolitan area. The study, therefore, concluded that the increasing environmental quality levels depend on the increasing quality of dwelling characteristics and satisfaction from the housing environment.

Studies on environmental quality of the areas have also been carried out in Africa. Alem and Martinsson (2011) investigated the importance of environmental quality to the poor and what the policy makers know about

it in Addis Ababa, Ethiopia. In their findings, although standard determinants of subjective well being in western countries seemed to explain happiness in Addis Ababa, yet environmental quality equally played a very prominent role. Averagely, the policy makers had more long-term perspective by focusing on health, education and housing. The citizens on their part focused more on short-term issues, such as controlling price rise.

In Nigeria, different people have equally worked on environmental quality for different cities or towns. Olorunfemi (2009) studied the willingness to pay for improved environmental quality among the residents of two landfills at Olushoshun and Abule-Egba close to Lagos metropolis. Results showed that the presence of the landfills and the associated environmental impact was an important factor contributing to respondents' willingness to pay for environmental improvement in their neighborhood. Furthermore, the proportion of responders willing to pay decreased consistently as distance increased away from landfills in the two locations. Again, respondents were generally not willing to pay high amount for environmental improvement.

Studying the housing improvement of core residential environmental quality of Ogbomosho town, Afon (1998) made use of 20 variables and identified 10 environmental quality indicators. In explaining the importance of the identification, the study expressed that it was no use for planners to impose their ideas on the public because people are better planned for when they have input into policy and programmes that will affect their present and/or future. Hence, it will be more effective if core residential housing improvements are carried out through the utilization of core residents' EQ1 data.

Ekurekong and Jacobs (1998) carried out a study on compliance that ensured high attachment of environmental quality in housing estate in Uyo, Akwa Ibom State. The study revealed that contraventions in development of the estate were mostly

committed by members of the ruling government (i.e. the political class). It was recommended that an environmental quality unit be established to monitor and control the quality of the environment in the estate.

Ede et al (2007) studied housing and neighbourhood quality for Yenegua, Beyelsa State. The study sampled five neighbourhoods in the city to examine the problem, using questionnaires and physical observation as instruments. The results showed that sanitary services, among other independent variables, have the greatest significance level of 99. In order to address the situation, it was recommended that existing regulatory measures, such as urban and regional laws, the national housing policy, the urban development policy and the state sanitation edict, must be vigorously enforced by the government.

Olarewaju and Fadairo (2003) identified poor state of streets as a problem which does not give room for efficient

evacuation of solid wastes. Okeke (2002) described the extensive use of temporary structures in the high density neighbourhoods of Nigerian urban centres as the forerunner of squatter settlement development, while Umeaku and Mba (1999) observed that storm water drainage paths were totally blocked in Onitsha with solid wastes which in turn induced urban flooding. In Enugu, the numerous and interlinked causes of urban solid waste management problems and the attendant economic, social and health costs as well as environmental and aesthetic costs are the inertia factor, the demographic factor, institutional factor as well as absence of public participation (Nwafor, 2008). According to a study on implementation of Enugu sanitary landfill carried out in 2000, appropriate design for environmental friendliness is recommendable in order to avoid contamination of the surrounding environment (Nwafor, 2008).

Methodology

The survey research design was adopted. Thirty (30) neighborhoods (stratified into low, medium and high density neighbourhoods) were used. From the neighbourhoods, samples were selected

randomly. The sample size for each stratum of neighbourhood was determined using Bowley's proportional allocation statistical technique.

The study area: Enugu

Enugu metropolis is located between latitudes 6°27' N and 7°28' N and longitudes 7°30' E and 8°19' E. The urban land area is roughly 72.8 km², with the rural environs covering an additional area of about 200 km². Enugu metropolis comprises three Local Government Areas (LGAs), namely Enugu North, Enugu East and Enugu South. It is bounded on the north by Isi-Uzo LGA, on the south by Nkanu West LGA, on the East by Nkanu East LGA, and on the west by Udi LGA.

Enugu metropolis, which lies on an altitude of 232.6 metres above sea level, exists with natural domes in the south and undulating plains forming the foothills of Udi escarpment in the north, and widening out into the upper Ebonyi river plains. It has an

annual rainfall of 1247.8 mm and the rainfall is mostly during the months of April through October, with July as the peak period. The temperature variation within the season is normally less than 10°C. The relative humidity fluctuates between 40 and 80 per cent.

The prevailing winds are the local monsoons; the north-east trade wind and the south west trade wind, resulting in dry and raining seasons respectively. The metropolis has a type of soil that is predominantly reddish brown in colour, with the underlying rock having a high load bearing capacity. This makes the soil suitable for intense building construction. The soil also supports moderate agricultural activities. The natural vegetation in the metropolis is primarily of tall, medium and short grasses. Most of the

tress are deciduous and include Isoberlina, sheer butter, and locust beans.

Enugu started as a photo-urban settlement near the mines, following the discovery of coal in the Udi Hills around 1909. Iva Valley and Ogbete areas, which were the first areas to develop, functioned primarily as coal miners residences. With the discovery of deep sea harbour in Port Harcourt, construction of the Enugu-Port Harcourt Rail line commenced in Enugu in 1914. In 1917, Enugu attained township status and was then referred to as Enugu-Ngwo. As a result of its rapid expansion towards areas owned by other indigenous communities rather than towards Ngwo highlands, it was renamed Enugu in 1928. By 1939, Enugu had become the headquarters of the then southern province.

Data collection

Questionnaire was used to collect primary data. It was designed using five-point linkert scale to address the objective of the study. The validity of the research instrument was measured using content validity. Test – retest method was used to determine the reliability of the research instrument. Also, field tests were carried out to determine the noise level, as well as the air quality in the study area.

The hypothesis formulated was tested at 0.05 level of significance. Analysis of variance was used to compare the environmental quality among the low, medium and high density neighbourhoods.

Twenty-one (21) residential environmental quality variables were used in the study, made up of 11 dwelling unit

Enugu became a regional capital and the most important administrative centre in the eastern region with the creation of three regions in Nigeria in 1961 (Ministry of Information, Enugu, 2002). Residential quarters developed earliest in Enugu included Coal Camp, Iva Valley, and Government Reserved Area (GRA). Other neighbourhoods established in the metropolis presently include Uwani, New Haven, Abakpa, Emene, Achara Layout, among others (ENHDC, 2011).

The population of the metropolis has been on the increase within the last few decades, as a result of rapid urbanization and subsequent influx of people. From 63,000 people in 1953, the population rose to 482,977 in 1991 and 722, 664 in 2006 (NPC, 2006: 12-16).

variables (conditions of floor, wall, window, ceiling, roof, lighting, structure, landscaping, nuisance, units, and neighbourhood problem). Five (5) parcel quality variables (condition of drives, fair condition of units, sanitary condition, drainage, and noise level) and 5 basic residential quality variables (crowdedness, good condition of units, air quality, waste disposal, and source of domestic water supply). The variables were used to obtain data in all the 30 neighbourhoods in the study area. Thereafter, the mean values of the various neighbourhoods in each of the low, medium and high density areas were found. SPSS version 13 was then used to analyze the data (ANOVA).

Results

The SPSS gave descriptive and ANOVA statistics in Tables 6.1 and 6.2.

Table 6.1: Aggscore: Descriptive

	n	Mean	Std. Dev	Std. Enos	95% conf int. for mean		Min.	Max.	Between
					Lower bound	Upper bound			
Low	5	17.812	9.03329	4.03981	6.5957	29.0283	7.24	28	
Medium	9	10.072 2	3.38779	1.12926	7.4681	12.6763	4.6	16	
High	1 6	14.787 5	12.55616	3.13904	8.0968	21.4782	2	54	
Total	3 0	13.877	10.17781	1.85821	10.0765	17.6775	2	54	
Model			10.15268	1.85362	10.0737	17.6803			
Fixed eff Ram				1.9412	5.5247	22.2293			93631

Table 6.2: Aggscore: ANOVA

	Sun of squares	Df	Mean square	F	Sig
Between groups	220.972	2	110.486	1.072	0.38
Within groups	2783.076	27	103.077		
Total	3004.048	29			

Discussion of findings

The results reveal that the residential environmental quality differs significantly among the low, medium and high density areas of the metropolis. From the analysis, the P significance is equal to zero and P is less than 0.05 significant level used in the study. Again, there are variances in the mean values for the three density areas. While the low density areas have the mean value of 17.812, the medium density areas have 10.072 and the high density areas 14.786. This indicates that the various residential

density areas have different environmental quality values.

However, against expectations, it was observed that the residential environmental quality in high density area is higher than what is obtained in medium density area. The influx of residents from low density areas to medium density areas as a result of high rental values of housing units in low density areas, and the sitting of some industrial outfits in medium density areas as a result of cost of procuring land possibly suggest why it is so.

Conclusion and Recommendations

Many existing housing units are deteriorating fast in the area. Solid waste management is posing a serious problem, some amenities are depleted and certain facilities have totally broken down, boiling down to degradation in the environmental quality of the area. Hence, unless urgent practical steps are taken to ameliorate the situation, the current wave in the global trend of environmental quality sustainability will continue to be a vision of illusion in the area.

Enugu State Government should strictly adhere to and enforce the law of zoning in the development of the area. Industrial outfits should not be allowed to be sited within the residential areas, so as to avoid pollution of any kind within the area. Besides, proper public enlightenment should be carried out to educate the residents of the area so that they dispose their waste appropriately and desist from littering the area with solid wastes.

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ENHANCING HEALTH WORKER EFFICIENCY IN NIGERIA: EFFECTS OF TRAINING AND RETRAINING

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Abstract

To enhance competence and output, organizations ought to put in place measures for employee training and retraining. This study examined the effects of training and retraining on health institution worker competency enhancement in Nigeria with specific emphasis on federal health sector workers in Southeast Nigeria. Questionnaire on likert-scale was administered to 269 respondents to generate the data analysed with the chi-square non parametric statistics in order to test the hypothesis. Findings showed that training and retraining of health workers enhanced organisational competence in the Nigerian health sector. The study recommended, among others, improved government emphasis on training programmes for health personnel to further enhance competence in Nigerian health institutions.

Introduction

Human assets are among the most important resources available to any organization, and employee competence and commitment largely determine the objectives an organization can set for itself and to its success in achieving them. Hence, the demand for effective employees continuously increases in both public and private organizations. The 'competency-based' approach to human resource management has become integral during the last thirty years, with competency encompassing the knowledge, skills, abilities, traits and behaviors that allow an individual to perform a task within a specific function or job (Boyatzis, 1982).

Organizational effectiveness is critical to success in any economy. In order to achieve increased and sustainable results, organizations need to execute strategy and engage

employees. To create organizational effectiveness, business leaders need to focus on aligning and engaging their people, management systems, structure and capabilities (including organizational culture) to the strategy. Hence in a dynamic environment, especially in health institutions, competency should be emphasized. This is necessary because competence includes the ability to respond to the dynamic nature of an organization's external environment and of its own internal processes.

The value of competency has been widely explored. Berger and Berger (2004) reported that six human resource factors that most contributed to the creation and sustenance of organizational excellence were a performance-oriented culture, low turnover, high levels of employee satisfaction, a cadre of

qualified replacements, effective investment in employee compensation and development, and the use of institutional competencies (success factors) in employee selection and performance evaluation processes.

Mitrani et al. (1992) mentioned the need for competency and predict that organizations of the future will be built around people. They added that there would be less emphasis on jobs as the building blocks of an organization, instead increased attention will be focused on employee competence. If people are the building blocks of an organization, then competence or what they bring to the job becomes crucial. The competency approach to selection and assessment is based on classifying, identifying, and measuring individual differences for particular work-related constructs that are relevant to successful job performance (Bartram, 2004).

Similarly, Cummings and Worley (2001) stated that organizational changes frequently demand new knowledge, skills and behavior from employees. In many cases changes could not be implemented unless employees gained new competencies. Change agents are needed to provide multiple learning opportunities, such as traditional training programmes, on-the-job counseling and coaching, and experiential simulations, covering both technical and social skills, and that it must be ensured that such learning occurs.

Exploring bicultural competence, Hong (2010) determined its antecedents, specified its impact on the two main roles bicultural individuals play in teams, and explored their impact on multicultural team effectiveness, and posited that biculturals are individuals who have deeply internalized two cultural schemas. A cultural schema is a set of knowledge about values, norms, and beliefs for a given culture. Therefore, biculturals are an increasing workforce demographic, and hence a growing part of multicultural teams. Their innate skills

that result from being bicultural may help solve central problems in multicultural teams, including managing conflicts and boundary spanning across cultures.

A recent meta-analysis reported an overall positive but very small effect size of multi-source feedback effectiveness (Smither et al., 2005). Practitioners should not expect large, widespread performance improvement after employees have received multi-source feedback. This article focuses on a specific type of multi-source feedback – a competency-based feedback programme and examined whether it helps managers develop their leadership competencies through a longitudinal study. The study sought the relationship between empowerment and effectiveness in the executive organizations.

It showed that there is a relationship among employee empowerment and organizational effectiveness in the Guilan executive organizations. Due to positive correlation coefficients it is the direct relationship, i.e., increasing empowerment will increase organizational efficiency. Also, it was shown that between competence, trust, impact, choice, meaningful jobs and competency with the organizational effectiveness, there is a direct and significant relationship. i.e., with increment of each of the variables, organizational effectiveness will increase. The findings revealed that managers' performance in the coming decade is primarily measured against the quality of their relationships with customers, followed by communication, team-building, and goal accomplishment competencies. Effective management performance is essentially linked to managers' ability to manage relationships, processes and time.

However, empirical research demonstrating the effectiveness of multi-source feedback is sketchy and mixed. This study reviews the current schools of thought in future studies and major business forecasts in order to

highlight the key areas of change in business environment and management. A survey questionnaire was designed and administered

to determine the perceptions of managers about managerial competencies and effective managerial performance.

Conceptual literature

Probably, McClelland (1973) was the first person to introduce the term, competency, to the literature, when he argued in his article, "Testing for competence rather than for intelligence", that traditional tests of academic aptitude and knowledge content predicted neither job performance nor success in life. Thus began the quest for theory and tools that could reliably predict effectiveness in the workplace. The first comprehensive data were drawn together by Boyatzis (1982) from the collection in the USA, using the McBer & Company 'Job Competence Assessment' method. Since then, competency has become a significant factor in human resource development practices (Simpson, 2002).

The word competency comes from a Latin word meaning "suitable" (Bueno and Tubbs, 2004). Boyatzis (1982:97) defined competency as "an underlying characteristic of a person which results in effective and/or superior performance in a job". A job competency represents ability. An individual's set of competencies reflects capability. A job competency may be a motive, trait, skill, aspect of one's self-image or social role, or a body of knowledge that an individual uses, and the existence and possession of these characteristics may or may not be known to the individual.

Similarly, Mitrani et al. (1992) stated that competencies could be motives, traits, self-concepts, attitudes or values, knowledge content, or cognitive or behavioral skills. Competency is an attribute, knowledge, skill, ability or other characteristic that contributes to successful job performance. The behavioural competencies required from employees of organisation are observable and measurable behaviors, knowledge, skills, abilities, and

other characteristics that contribute to individual success in the organization (e.g. teamwork and cooperation, communication). These behavioral competencies can apply to all (or most) jobs in an organization or be specific to a job family, position, or career level hence it describes what is required to be successful in an organization beyond the technical requirements for the job. As such, behavioral competencies are specific to a person rather than to a job.

Morad et al (2011) argue that empowerment is a new concept that attracted many scholars of management. This concept includes various psychological conditions such as impact, competency, choice, meaning, the jobs and trust. Despite rapid changes, technological developments and overt and covert competition in the world have revealed the importance and necessity of empowering. Empowerment can influence or improve development and organizational effectiveness. Effectiveness is simply the degree or extent that the organization achieves its objectives.

Fretwell (2002) posited that employee morale within an organization has a direct impact on the satisfaction level of its customers and the company's ultimate success. When relationship-based leaders promote core competency development of its workforce throughout the organization, an opportunity exists for ensuring high employee morale and customer satisfaction, an increase in employee and customer retention rates, and a positive long-term outlook for the company's successful performance.

Examining competency from a multi-source point of view, Guangrong et al (2010), posited that multi-source feedback interventions have become widespread in many

organizations around the world. It has been reported that multi-source feedback is used by 90% of the 'Fortune' 1,000 companies in the United States and 85% of Australia's top 500 corporations. The popularity of such a human resource practice has stimulated much research enthusiasm in the academic field. In general, the practice of providing multi-source feedback is viewed favorably, with researchers espousing the potential benefits for performance improvement at both the individual and organizational level (Fletcher and Baldry, 1999).

Competency is a broad, multidimensional concept. There has been much work in competency, and unfortunately this has led to some confusion of the definition, and adding to the complexity for research

involving competency. Considering the importance of the health sector to the growth of the organisation, employees and employer must be trained and retrained to ensure high level of competence. The ability of health worker to show proficiency is essential in instilling confidence on patients. However, reports are lacking on the importance of competency in enhancing organisational competency and efficiency of health workers. Therefore, this study seeks to examine the effect of training and retraining on the enhancement of organisational competency and efficiency of health sector workers in Nigeria with specific emphasis on Federal Health Sector workers in Southeast Nigeria.

Methodology

The descriptive survey method of research was used to generate the data for this study. Primary data were obtained through survey using oral interview and questionnaire.

The areas of this study consisted of five Federal Health Institutions in five South-East States of Nigeria. These were, University of Nigeria Teaching Hospital, Enugu, Federal Medical Centre, Abakaliki, Queen Elizabeth Specialist Teaching Hospital, Umuahia and Nnamdi Azikiwe University Teaching Hospital, Akwa.

The population from which the sample responses were generated comprises both the staff as well as patients of these hospitals. A

pilot survey was conducted by the researcher and 20 questionnaires were distributed to both staff and patients of the hospitals. From the pilot questionnaires issued, a sample size of two hundred and sixty-nine (269) respondents was used for the study.

This study's main trust was to determine whether training and retraining of medical staff workers can enhance organisational competence of health personnel, hence using the Likert-type questionnaire, which was distributed to the target population. The chi-square non-parametric statistics was used to test the hypothesis.

Results and discussion

Table 3.1 gives the distribution of completed and returned questionnaire copies.

Table 3.1: Questionnaire response distribution

Details	Number administered	Number returned and used	% Questionnaire administered
Staff	73	69	30
Patients	196	167	70
Total	269	236	100%

Source: Field Survey, 2012

Out of the two hundred and sixty-nine (269) questionnaires distributed to the target population, two hundred and thirty-six (236) questionnaires were returned. Sixty-nine (69) questionnaires were returned by staff of these federal health institutions which represents thirty percent (30%) response rate and one hundred and sixty-seven (167) questionnaires was returned by patients. This represented seventy percent (70%) percent response rate.

Hence, the total numbers of questionnaires returned were used to test the hypothesis.

Table 3.2 shows responses on enhancement of organisational competency of Nigerian health workers through training and retraining.

Table 3.2: Enhancement of organisational competency of Nigerian health workers through training and retraining.

Extent	Staff	Patients	Total	Percentage (%)
Very High	32	65	97	41
High	18	72	90	38
Very low	2	10	12	5
Low	1	3	4	2
Moderate	16	17	33	14
Total	69	167	236	100

Source: Field Survey, 2012

Table 3.2 reveals that thirty-two (32) and sixty-five (65) respondents from the staff and patients' group say that training and retraining of health personnel have enhanced organisational competence to a very high extent. This represented a total of ninety-seven (97) respondents (or 41%). Eighteen (18) staff and seventy-two (72) respondents (a total of 90 respondents or 38%) admitted to a extent that training and retraining enhance organisational competence. Two (2) staff and ten (10) customers (a total of 12 respondents or 5%) say that the training and retraining enhance

organisational competence to a very low extent. One staff and three (30 customers (a total of 4 respondents or 2%) responded that training and retraining enhance organisational competence to a low extent. Lastly, sixteen (16) staff and seventeen (17) respondents (a total of 33 respondents or 14%) said that training and retraining enhanced organisational competence to a moderate extent.

Using Table 3.2, the hypothesis formulated was tested. The steps taken to test the hypothesis were three. In step one, the hypothesis is restated in null and alternate

forms. Step two presents the analyses of the SPSS results. In step three, brought forth the decision. As a rule, the rejection of the null

implies the acceptance of the alternate hypothesis.

Step One: Restatement of the hypothesis in both null and alternative forms

H₀: The training and retraining of health personnel have not enhanced organisational competency of health sector workers in Nigeria.

H₁: The training and retraining of health personnel have enhanced organisational competency of health sector workers in Nigeria.

Step Two: Analyses of SPSS Results of the hypothesis tested

Table 3.3 To what extent do you think that training and retraining of Health workers enhance organisational competency of Nigeria health sector?

	VHE	HE	LE	VLE	ME	Total
Staff	32	18	2	1	16	69
Patients	65	72	10	3	17	167
Total	97	90	12	4	33	236

Key

- VHE = Very high Extent
- HE = High Extent
- LE = Low Extent
- VLE = Very Low Extent
- ME = Moderate Extent

Table 3.4: Chi-Square Test Table for hypothesis

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-square	19.354 ^a	4	.001
Likelihood Ratio	20.813	4	.000
Linear-by-Linear Association	3.139	1	.076
N of Valid Cases	304		

Source: SPSS Computation Results

From Table 3.4, Chi-Square calculated value is 19.354, which is greater than the tabulated chi-square value (at df = 4) of 9.48773; and sig value is 0.001<0.05. If the calculated Chi-Square value is greater than the tabulated Chi-

square value, or if the sig. value is less than the critical value at which the test was carried, the null hypothesis should be rejected, and the alternative hypothesis accepted.

Step Three: Decision

From the analysis above, the Null hypothesis was rejected and the Alternative hypothesis accepted, which states that training and

retraining of Health workers enhance organisational competency of Nigeria health sector.

Conclusions and recommendations

Training and retraining are important human resource tools which assist in enhancing proficiency of employees, and at the same time, ensuring job satisfaction. Though, the findings from this paper shows that training and retraining enhances organisational competency more still needs to be done in this area. Health Institutions should be adequately

equipped with necessary manpower and equipment. Government should rearrange the learning programmes for health personnel and adequate remuneration provided for them. A healthy nation is a productive nation – therefore, the neglect of training and retraining, which has been experienced in the past, should be addressed.

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