SAND-DIGGING AND SOIL EXCAVATION AS AN ENVIRONMENTAL DEGRADATION FACTOR IN ADO-ODO/OTA LOCAL GOVERNMENT AREA, OGUN STATE: AN INTERROGATION OF THE APPROPRIATENESS OF CONSTRUCTION TECHNOLOGY IN NIGERIA

Samson R. Akinola
Policy Analyst, Governance Expert,
Development Planner & Environmentalist
Covenant University,
Canaan Land, Ota,
Ogun State, Nigeria

&

Simon, R. Funsho
Department of Estate management,
Covenant University,
Canaan Land, Ota, Nigeria

Abstract
This paper uses Polycentric Planning, an off-shoot of the Institutional Analysis and Development (IAD) framework to interrogate the appropriateness of construction technology in sand-digging and soil excavation in Ado-Odo/Ota Local Government Area, Ogun State. The paper found that the technology adopted in sand-digging and soil excavation for the purpose of road and housing constructions is inappropriate for clean technology. Thus, the processes of degradation of the communities studied have intensified in recent times due to uncontrolled urbanization. It was also found that the average depth of digging in three sites is 6 meters; the average distance of sites distance to nearest building is 9 meters; the average distance to the nearest stream is 750 meters; the average distance to the nearest road is 18 meters; and the average area covered by the dug sites is 4.6 hectares. The crude method of soil excavation is causing untold damages to private property and infrastructures such as roads, electricity poles, drainage, etc. Similarly, it was found that excavation activities have induced damages on the existing drainage pattern due to sediments discharge to adjacent water bodies with the implication of inducing flooding.
Using Polycentric Planning and Poverty Reduction Strategy, this paper adopts an African Polycentric Sustainable Environment Model (APSEM) for restructuring decision making on environment to conserve and protect environmental resources. The model and the proposed new institutional mechanism would enable local people and professionals/practitioners in the built environment to have a robust dialogue with the local government officials in order to reposition urban councils to effectively manage urban environment and conserve natural resources.
Keywords: Polycentric Planning, Institutional Analysis and Development, Poverty Reduction Strategy, sand-digging and soil excavation

INTRODUCTION

Akinola (1997a,b, 2008q) found that the impact of oil extraction, brewery and cement industries, gold mining, road construction and steel plant have direct

negative impact on the welfare of citizens. There was absence of community participation as an important planning input into decision-making on resources within the environment where citizens are placed by providence. Where EIA reports were prepared, the welfare of community residents was not considered a priority in project design and implementation. The impact of these projects on the local people can be summed up as deprivation and poverty. Oil drilling, gold mining and blasting of limestone and iron ore result in displacement, dislocation and other attendant consequences. In addition, these projects led to loss of employment opportunities, air and water pollution, deforestation, decrease in soil fertility and ill-health. Lack of compensation and/or inadequate compensation to the affected people cut across all the cases. Where properties of local people were negatively affected in the course of mining and industrial development, the real values of property were hardly determined, not to talk of appropriate compensation to the victims. For instance, the impact of International Brewery, Ilesha, led to a reduction of 54.5% in the yield of farm products (both food and cash crops) (Akinola 1997a,b, 2008q). It varies among the development projects: steel plant, 10.0%; and road construction, 33.0% for rural areas and 57.6% for urban areas (Akinola and Awotona 1997:200).

This paper uses Polycentric Planning, an off-shoot of the Institutional Analysis and Development (IAD) framework to interrogate the appropriateness of construction technology in sand-digging and soil excavation in Ado-Odo/Ota Local Government Area, Ogun State. While both sand-digging and soil excavation are used interchangeably, terminologically, sand-digging differs slightly from soil excavation in the sense that the former refers to removal of soil to sandfill wetlands or for embankment in road construction, while soil excavation defines removal of soil in order to lay foundations of buildings and install other structures such as pipelines, cables, etc.

The paper found that the technology adopted in sand-digging and soil excavation for the purpose of road and housing constructions is in appropriate for clean technology. Thus, the processes of degradation of the communities studied have intensified in recent times due to uncontrolled urbanization. Consequently, the paper analyses the consequences of sand-digging and soil excavation in construction industry in the selected communities within the study area. The paper found that the crude method of soil excavation is causing untold damages to private property and infrastructures such as roads, electricity poles, drainage, etc. Similarly, it was found that excavation activities have induced damages on the existing drainage pattern due to sediments discharge to adjacent water bodies with the implication of inducing flooding.

Apart from the fact that natural resources should be utilized ecosystemically, local residents around projects should be made to benefit from development projects through adequate planning and welfare oriented decision making. The paper argues that environmental governance that balances the equation of environmental resources utilization among the stakeholders in the environment should be adopted. Environmental governance can be described as the way the society as a whole manages the full array of its politico-economic and social environment by shaping the incentives available to individuals and local communities with regard to natural resources exploitation and utilization. It can also refer to the type of relationship between the stake-holders - government, industrialists and host communities. If the relationship is positive sum, then there is good environmental governance. The governments and industrialists are, therefore, faced with situations in which they have to establish code of conduct in close dialogue with local stakeholders and communities.

Using Polycentric Planning and Poverty Reduction Strategy, this paper adopts an African Polycentric Sustainable Environment Model (APSEM) for restructuring decision making on environment to conserve and protect environmental resources (Akinola 2008q, 2011e:68; Akinola and Adesopo 2011d:259). The model and the proposed institutional mechanism would enable local people and professionals/practitioners in the built environment to have a robust dialogue with local government officials in order to reposition urban councils to effectively manage urban environment and conserve natural resources. This, invariably, would produce a new urban governmentality that is polycentric, citizens driven and inclusive; thus, entrenching good urban environmental governance and citizens-centred planning.

METHODOLOGY

The methodology adopted involves the identification of areas and points of environmental degradation such as sand digging and soil excavation in Ado-Odo/Ota Local Government Area (LGA) of Ogun State in 2011. The selected communities in the LGA are: Iju, Onibukun, Atan and Igbele-Ajana where sand-digging and soil excavation operations for road and housing constructions have existed for several years. The selected communities have experienced invasion of large number of developers and land speculators seeking to erect buildings for financial gains. The footprints of digging and excavation were mapped out and measured in both area covered and distance to the nearest roads, property and other infrastructure. The constructions of Lagos-Abeokuta and Ota-Idiroko international highways have no doubt left some injurious foot prints of pockets of dug sites in the communities. Pictorial analysis was also adopted for data analysis and presentation.

POLYCENTRIC PLANNING PERSPECTIVE ON ENVIRONMENT AND DEVELOPMENT

A survey of literature confirms that increased development activities without environmental ethics and polycentric planning invariably degrade environmental resources and consequently affect the welfare of the people. Polycentric planning is a deliberate act of setting up multilayered and multicentred institutional mechanism that regards self-governing capabilities of local communities as foundation for reconstituting order from the bottom up. It can also be described as the process of ordering the use of physical, human and institutional resources as well as engaging the citizens in contractual relations with the public authority. It regards community self-governing institution as a major player in development process (Akinola 2009b, 2010a,i, 2011a).

This approach recognizes the fundamental defects in the centralist model of governance and the persistent failure of the state to meet the collective yearnings and aspirations of the citizenry. Polycentric approach to problem-solving is considered imperatives to the constitution of order in a human society where people share a community of understanding in proffering solutions to their own problems of daily life in a rule-ordered relationship (V. Ostrom et. al. 1988:51; Akinola 2007f, 2008b, 2009b, 2010a,i, 2011a). The approach emphasizes the development of an alternative institutional paradigm by calling attention to the self-governing and self organizing capabilities of the people. Though this alternative paradigm was originally conceived within the context of American experience, it has become a potent alternative effectively employed by African scholars in their works (Ayittez 1991, 2006; Olowu 1999, 2006; Ayo 2002; Akinola 2005d, 2007f, 2008b, 2009b, 2010a,i, 2011a,b,d,e). These scholars have confirmed the resilience and effectiveness

of institutions designed through shared norms and managed by the people through collective action. This is the fundamental of the Institutional Analysis and Development (IAD) framework, developed over the years by Vincent Ostrom and Elinor Ostrom and colleagues at the Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, USA. The IAD believes in institutional arrangement designed by people who cooperate based on rules and constitution of their choice, and thereby able to resolve socio-economic and political problems which other people (external to their conditions) are not capable of doing for them.

Any development project that is people-oriented must of necessity incorporate the input of citizens right from the planning stage. That is why all the stakeholders in development (local people and professionals/practitioners in the built environment) must regard themselves as colleagues with equal standing within development arena. Though development projects are associated with a lot of socio-economic and political benefits, recent studies show that the environmental impacts of such projects are directly linked with environmental abuse and poverty, diseases and low productivity (Omoweh, 1993; Rowell, 1994; Boele, 1995; Robinson, 1996; Esparza and Wilson, 1999; Obi, 1999; Akinola, 1998:290, 2000:178; Akinola, 2003; Obi, 2004:449). The percentage of people living in poverty is larger in Africa and the poor are poorer than in any other region. Africa is a prominent part of the world where the number of poor is increasing. Up till late 1960s, development projects had been emphasized and embarked upon, without restraint as the main target of every regional/national government in order to increase per capital income and consequently, the welfare of the citizens (West, 1975).

The concern for environmental abuse passed on the society was more pronounced after the Second World War when the industrial enterprises increased in scale and number. However, the need to balance the equation of development between the forces of technology and welfare has arisen with the concept of Environmental Impact Assessment (EIA) that originated from USA in the early 1970s. It was reasoned, then, that there was the need for mechanism whereby all development proposals are subjected to total environmental consequences. Environmental Impact Assessment which emerged in the early 1970s has become a widely accepted tool in environmental management. Since then, other countries of the world have adopted the system, though with different degree of enthusiasm (Wathern, 1994:3). While several developed countries have adopted the system, very few countries in Africa like Rwanda, Botswana and Sudan have experience of EIA (Klennert, 1984). It was adopted in Nigeria in 1988.

Environmental Impact Assessment (EIA), according to Munn (1979) can be described as a process of identifying the likely consequences for the biogeophysical environment and for man's health and welfare of implementing particular activities and for conveying this information, at a stage when it can materially affect their decision, to those responsible for sanctioning the proposals. Davies and Muller (1983) argue for an extension of this definition to cover socio-economic effects to provide for a unified appraisal. The concept of EIA is a logical response to the belief that development can be planned to make the best use of environmental resources and to avoid degradation. Because of this concept, EIA requires that all major developments or projects must be preceded by environmental impact statement. Such development projects include industries, motorways, airfield, railways, harbour and other significant urban field.

The positive impacts of development projects are not considered in this paper since they are the expectations of both developers and the general public. The negative impact is more critical for consideration. This is largely due to some

fundamental reasons. The United Nations Conference on the Human Environment (UNCHE) held in Stockholm in 1972 arrived at a decision that there is a link between development and the environment. The concept of sustainable development (Brandtland, 1987) buttressed the same point (Williams, 1993). The World Commission on Environment and Development (1987), commonly called the Brundtland Commission, clearly recognized the necessity for a broad approach to sustainability. It stated that "sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological and institutional change are all in harmony and enhance both current and future potentials to meet human needs and aspirations".

All the components of the environment interact and change one another to maintain a balance over time. The activities of man seem to dominate those of other components of the environment, whereas "in the order of existence, humanity is a late comer to the natural environment" (Brenda, 1948:9). The interplay between the two actors (man and the natural environment) suggests that lack of planning and/or unchecked manipulation of the environment may lead to self-defeating of human race. The process of degradation of the earth's surface has intensified in the recent times of human history all in the name of technological advancement and civilization. Calder (1970) opines that "irrational actions" of our global civilization which were dictated by greed or were the result of ignorance, have their serious consequences.

Forester (1971), Meadows, et. al., (1972), Mesarovic et. al., (1974) and other researchers believe that ecological crisis is as a result of intrinsic desire of humankind to expand and to grow. Commoner (1971) notes that the basic reason for environmental crisis is social. "... the fault lies with human society with the way in which society has elected to win, distribute and use the wealth" (Commoner, 1971:178). Blackstones (1974) also argues that the basic causes of the environmental crisis are mistaken values and attitudes. Akinola (2003, 2008b,q, 2011b,d,e) corroborates these views through various studies in Nigeria by tracing environmental crisis to the problems of disconnect that separate leaders from the people.

It has been argued that man is not an optimizer. Rather, he must be viewed as a satisfier, who at any time can choose a course of action which can be satisfactory to him but not necessarily logical and profitable. This fact "not optimizer but satisfier" has been suggested as one of the important issues in the determination of human activities in most part of the world. And in this regard, it has constituted a strong factor in man-environment relationship and the resulting pattern of landscape. International Centre for Economic Growth (1996), however, has argued that the environment also forms an important component of the quality of life; thus, increasing the quality of the environment must be an objective of development.

Both macro-justice principles which is concerned with the welfare of the group and micro-justice principles with the welfare of the individual (Rawls, 1972:60) focus on the distribution and utilization of resources within the society to increase the welfare of the people. The environmental ethic or environmental justice considers future generation in deciding the present needs. It has also been argued that justice demands that all the major actors in creation must be taken into account in our justice related decisions (Oyeshola, 1995:61).

Most environmental or ecological degradations came along with the birth of industrial revolution which also brought along with it mass exodus of people to urban areas. The industrial revolution with its complex technological and economic changes produced spectacular increases in world population and cities. According to Leitmann (2005), in the developing

countries, the rural poor migrated to cities and accelerated urban population growth that usually led to the chaotic and repulsive urban atmosphere. Sub-Saharan Africa has long been one of the least developed and least urbanized regions of the world with most sub-Saharan African economies still heavily dependent on subsistence agriculture. Nevertheless, the region has absorbed relatively high rates of urban growth over the past 50 years. In 1950, only 15% of the Africa population was living in towns or cities, while 39.9% lived in urban areas in 2000 (United Nations 2002; Satterthwaite et. al. 2010:2812). By 2030, about 53% of Africa's population is expected to be living in urban areas (Cohen 2004:39).

However, cities have been identified as engines of development and the proportion of environmental damages will continue to increase relative to the rate of physical development of which building and road constructions are highest. It is, therefore, instructive to take proactive steps by rethinking on strategies for preserving urban ecosystem natural landscape. In order to achieve the objectives of rational use of natural resources in our cities and urban fringes, it is imperative, not only to articulate effective physical planning policies and development control system but equally important is the need for inclusive system that will regard citizens and developers as active agents of environmentalism[1] and people-centred development. This is particularly necessary in the case of Ado Odo local government council area where the incidences of sand-digging and earth excavation for road and building constructions have reached alarming proportions.

This becomes critical in the light of the unrestrained human activities in Nigerian cities that have contributed immensely to environmental destruction and ecological crisis. These activities themselves are not bad; they are bound to occur if there has to be development and progress but, lack of effective control has been the major problem. The World Bank (1991) reported that environmental degradation directly affects the lives of about 50 million Nigerians. In economic terms, Nigerians environmental losses amounted to about ₦25 million or 13.0% of 1991 Gross National Product (GNP) (The Nigerian Environment, Vol. 3, No. 1, March 1991 cited in Oyeshola, 1995:47).

Economic growth in Nigeria was strongly biased against agriculture since the early 1980s, but in favour of mining of mineral resources, especially oil minerals. Incidentally, the major occupation of the majority of Nigerians is predominantly farming. However, the activities of mining and other development projects constitute destructive impacts on agricultural land and environment and consequently on farming. This implies that a large percentage of farmers have their land and other resources exposed to destructive virus of mining and other development projects. Worst still, most of the proceeds from these projects are diverted towards public spending which are skewed in favour of well-to-do citizens, while local people suffer.

Studies have traced the major causes of environmental degradation in Nigeria to industrial activities, mining operations, deforestation, pollution, engineering and construction works (Ayodele, et. al., 1987; World Bank, 1988; Chandler, 1990; Akinola and Awotona 1997; Akinola, 1992, 1997, 1999, 2003, 2008q). All these activities have their negative impacts on soil and water bodies which are the platforms for farming activities. This view is premised on four grounds, namely: (1) industrial activities are related to pollution, (2) mining operations and oil spillage engender environmental degradation and poverty, (3) deforestation causes infertility of soil and low agricultural yield and (4) engineering and construction works have latent implication on environmental degradation and poverty.

[1] Environmentalism is the actions and movements towards conservation of natural resources.

For example, Akinola (1997b) shows that three road projects in Osun State constituted serious problems and poverty to the citizens. They were: (a) Ife-Ibadan dualization project (a Federal Government project) - 88 kilometers distance; (b) Osogbo-Ilesa rehabilitation project (a federal government project) - 31.8 kilometers; and Osogbo West by-pass project (Osun State Government project funded by the World Bank) – 7.8 kilometers. All these projects have direct link with economic growth, but their interactive links with the environment is crucial for overall development of the community in which they are located and that of the nation at large.

The impact of road construction during the Ife-Ibadan dualization project was traced to destruction of farmlands, demolition of property and deforestation of about 300 hectares of land which remained exposed to erosion for about 5 years. The project took too long period of construction; from 1993 to 1998. It was also found that the construction of Ife-Ibadan road (dualization project) and that of Osogbo West Bypass were not subjected to environmental impact assessment before the commencement of these projects, hence, the impacts were not anticipated and the affected persons suffered in no small measures. For instance, during the construction of Ife-Ibadan road, damages done to existing road led to several accidents, which claimed more than 20 lives (Akinola and Awotona 1997:200). It was clear that all the selected development projects constituted, directly or indirectly, a causative factor of poverty on innocent citizens who supposed to have benefited from the projects. In Osun State, 53.0% of the victims were compensated and those compensated complained of inadequate compensation. The amount of compensation in relation to the worth of crops destroyed and houses demolished in rural area was 34.0% and 31.0% respectively, while the comparable figure for the affected urban-based property was 57.6% (Akinola and Awotona 1997:200).

The common denominator to the development projects was that of negative impact on the people within the micro environment. The attitudes of developers - governments and private organizations, had not been positive towards the affected citizens. Unfortunately, all these negative impacts have continued to emerge and exist side by side with environmental laws[2] that supposed to prevent the emergence of these negative impacts.

In spite of all these laws and regulation, the local people were not involved in decisions concerning their environment. As a result, there exists a gap between those who manage the industries and the local people. This suggests that there are lapses in these laws. As long as the laws do not make provision for the people's involvement in decision making, the needs of the people will be difficult to address. These projects, no doubt, constituted avenues for increasing per capital income of the country, and in some cases enriched private individuals, the poor citizens were rendered poorer and those that were well to do before became poor. The case is like

[2] The Federal Environmental Protection Agency (FEPA) was created in 1988 to ensure that industrial activities and wastes management practices are compatible with the overall national goal of bequeathing a clean and safe environment to present and future generations in Nigeria. In 1992, Environmental Impact Assessment Decree 86 was enacted and all major projects were to be subjected to environmental consideration before their commencement. The projects in this category are: agriculture, airport, drainage and irrigation, land reclamation, fisheries, forestry, industry, infrastructure, ports, mining, petroleum, power generation and transmission, quarries, railways, transportation, resort and recreational development, water supply, and waste treatment and disposal. Further thrust in dealing with the issue of environmental quality was made by the Urban and Regional Planning Decree No. 88 of 1992, indicating the type of projects which should be backed up by EIA report. However, lack of enforcement of EIA in Nigeria is a major obstacle to the use of EIA as a strong instrument of development control (Akinola, 1995c).

robbing Peter to pay Paul. The rights of the affected citizens to basic needs of life had been consistently denied.

Discussion in this section shows that unrestrained human activities invariably engendered increasing environmental degradation, low standard of living and poverty. The case in Nigeria will be difficult to curtail unless EIA is enforced and made compulsory for both private individuals and government agencies before the commencement of all development projects. In particular, the adoption of polycentric environmental planning that places the rights of the local people side by side of those of the industrialists will go a long way in compelling the industrialists to comply with environmental standards.

It is therefore, important to situate Nigeria's construction activities, especially sand-digging and soil-excavation, within the context of polycentric environmental planning to see whether these activities are carried out in consonance with environmental ethics and standards.

ENVIRONMENTAL IMPACT OF SAND-DIGGING AND SOIL EXCAVATION IN ADO-ODO/OTA LOCAL GOVERNMENT AREA, OGUN STATE

The natural resources in Ado-Odo/Ota Local Government Area are diverse, ranging from springs, streams, rivers, forests and other forms of vegetation. Apart from farming, the land is still very much less utilized for other forms of development. Most of the plantation farms are gradually paving way for other uses like commercial, industrial and institutional uses. However, most part of the undeveloped land has been sold out by the landowners (Omo Onile) for financial gains. The landuse is divided into five categories: (1) the built up area, (2) farming activities, (3) vegetation, (4) wetland and (5) the bare surface area.

Table 1: Sand-digging Activities in Selected Communities in Ado-Odo/Ota LGA

Site location	Depth of Digging(metres)	Distance to the nearest building (metres)	Distance to stream (metres)	Area of Dug (in sq m)	Distance from major road (metres)
Iju site 1	3 – 12	3	700	92,650	10
Iju Site 2	6 - 9	5	800	46,325	5
Onibukun	3.5	20	n/a	21.6	39.2
Average	6	9	750	46,332.2	18

Source: Author's field survey (2011).

Table 1 shows detailed measurement of the dug sites in relation to depth and distance of the sites to the main road and the nearest streams. The average depth of digging at the three sites is 6 meters; the average distance of the sites to the nearest building is 9 meters; the average distance of the sites to the nearest stream is 750 meters; the average distance of the sites to the nearest road is 18 meters; and the average area covered by the dug sites is about 4.6 hectares. The crude method of excavation is causing untold damages to private property, and infrastructures such as roads, electricity poles, drainage, etc.

It was discovered that excavated sites during the constructions of Lagos-

Abeokuta and Ota-Idiroko international highways have left some injurious foot prints of pockets of dug sites with the consequence of breeding mosquitoes and being derelict in those communities. The bare surface areas are currently degraded by massive excavation and digging as depicted in Plates 1 – 5. These sites are a long, deep cut of derelict land. At a glance, this presents a picture of rough impact of digging and confirms the extent of the environmental degradation caused by sand-digging. The common impact includes a series of environmental problems: soil erosion, loss of cropland, deforestation, ecosystem destruction, and extinction of species and varieties.

Plate 1: A Series of Excavated Sites that Endanger the Major Ota-Idiroko international highway.

Plate 2: Excavation that endangered Electric Pole

Plate 3: Excavation at a closed proximity to the major Ota-Idiroko international highway

Plate 4: Excavated Site Converted to Refuse Dumping Ground

Plate 5: Depth of Excavation that Subsumes Vehicles very near the major Ota-Idiroko international highway.

Plate 1 shows series of excavated sites that endanger the major Ota-Idiroko international highway on both sides of the road. The road, due to lack of effective drainage, is susceptible to collapse as erosion digs on both sides of the road. As shown in the pictures, the excavation site which covers several square metres is already a hazard generating area and may not be suitable for any form of residential development. The site is liable to floodwater retention and soil creep incidence. The depth of digging and proximity of the site to the major road artery is something to worry about. As depicted in the pictures displayed, the dug sites in some cases are too close to residential property. Survey pictures reveal further how an electricity pole is left aloft after being dug round about.

Analysis shows that environmental degradation occasioned by sand-digging in the communities is caused by laxity in environmental law and ineffective development control. The failure of government in environmental education coupled with greed and selfishness of individuals reinforced by poverty are all due to lack of environmental education and enlightenment. This is as a result of socio-economic and political deprivations that interact with each other in ways that can increase the state of lack in which the poor people live. The struggle for short-term profit by individuals in sand-digging activities, encouraged by absence of development control has led to these environmental abuses.

It has also been argued that unrestrained human activities in Nigeria as in other parts of the world contribute immensely to environmental destruction and ecological distortion (Brenda, 1948:9; Calder, 1970; Forester, 1971; Commoner, 1971; Meadows, et. al., 1972; Blackstones, 1974; Mesarovic et. al., 1974; Rawls, 1972:60; Omoweh, 1993; Rowell, 1994; Boele, 1995; Oyeshola, 1995:61; Robinson, 1996; Esparza and Wilson, 1999; Obi, 1999; Akinola, 1998:290, 2000:178; Akinola, 2003; Obi, 2004:449). The World Bank (1992) has reported that environmental degradation directly affects the lives of about 50 million Nigerians and when weighed economically the nation lost a lot of money amounting to ₦25 million or 13% of 1991 Gross National Product (GNP).

For instance, greed and selfishness are manifested in the attitude of somebody digging near the fence of another person's property. He should know that he is endangering the property of his neighbor. This is where the Golden Rule becomes applicable in re-ordering human interactions and behaviours if we are to organize a peaceful and prosperous human society.

The major Ota-Idiroko international highway (Pates 1, 3 and 5), which serves as both regional and international route may be subjected to dereliction except the excavated area is properly managed in a manner that future flooding within the area is prevented. Apparently, 5 to 10 metres set back distance between the road and the dug sites in Iju is rather too close and indeed a serious danger for the road users as dug sites generate and accentuate flood and sedimentation on the road.

Both sand-digging and excavation activities in the area have series of alteration effects on drainage patterns due to erosional effects and sediments discharge to adjacent water bodies with the implications of water pollution for the urban fringe community and inducing future flooding. In addition, digging generates negative impacts on natural resources by removal of scrubs and other variety of vegetation, including economic trees, coastal and valley freshwater marsh. These findings corroborate Ujoh (2009) who affirms that man's dependence on the physical environment for his basic needs has generated actions and inaction in various areas and at various times - often translating into land conversion, alteration and modification, much of which degrade and severely damage the fauna and floral components of the environment.

It is on this note that this study further explores the destinations of excavated soil and found that sand excavated are used for sand-filling to reclaim wetlands and thus disturbing ecosystemic balance. This constitutes antagonistic postures to achieving conservation of natural resources. There is no doubt about the need for sand-filling some wetlands and swampy areas but it has to be planned and controlled. Indiscriminate sand-filling of wetlands is a notorious practice in Lagos, which constitutes a serious threat to wetland potentials and ecosystemic balance. Sand digging activities have increased in contemporary times as developers acquire such land cheaply but to be sand-filled for property development that are usually sold at higher prices. In Lagos Metropolis, especially in Lekki-Ajah axis, Victoria Island, most wetlands have been converted to solid land through sand-filling. Invariably, this has accentuated disastrous flooding in Lagos, especially that July of 2011 in which virtually all parts of Lagos State were flooded, forcing residents to out of their homes, while 20 people died (ThisDay Newspaper, 15 July 2011).

During the 1700s, wetland were regarded as swampy lands that bred diseases, restricted overland travel, impeded development and the production of food and fiber, and were not useful for man survival. However, by the middle of the 20th Century, views about wetland changed considerably as its value has become clear (Dahl and Allord 1990). Wetlands are highly productive and valuable ecosystems as they provide a number of ecological and economic (goods and services) functions that are of value to humans (Barbier 1991).

Ecologically, their services relate to direct geographical processes such as sediment retention, the provision of flood and storm buffering capacity, as well as climatologic and biological functions such as local and global climate change and stabilization, preservation of biodiversity and provision of natural environmental amenities. In addition, wetlands provide natural resources such as water, fish and other edible animals, wood, etc. as well as natural environment for recreational activities (Larson et. al. 1989; Barbier 1991, Barbier et. al., 1997; Brouwer et. al., 1999; Woodward and Wui 2001). It is in this context that wetlands have been described both as "the kidneys of the landscape", because of the hydrological and chemical circles functions they perform and as "biological supermarkets" due to the extensive food webs and rich biodiversity they support (Ajibola 2009).

Wetlands offer sanctuary to a wide variety of plants, invertebrates, fishes, amphibians, reptiles and mammals, as well as to millions of both migratory and sedentary waterbirds (de Groot 2007). They are also important global resources, sinks and transformers of various elements in the earth's various biogeochemical cycles (Mitsch and Gosselink 2000; Greb and DiMichele 2006). By so doing they manage greenhouse gases, especially by acting as significant carbon sinks and thus buffering climate change impacts.

Considering these immense climatic regulatory functions of wetland, it needs to be conserved. It needs to be emphasized that conservation is not against development. It only supports lifestyles that the mother earth can support. Conservation is about managing the biosphere not only for the benefit of people living today, but for future generation. Thus, it is advisable to integrate conservation with development efforts.

One of the major challenges in Ado-Odo/Ota communities is lack of influence of Local Planning Authority (LPA). The proximity of these communities to Lagos Mega City has compounded their environmental challenges most of which arose from slums development. It is disgusting to observe the alarming rate at which the once admirable rural settlement has been developing haphazardly without recourse to planning laws. These

communities are characterized by disorderliness, poor coordination and decaying - a situation of slums formation. In spite of the existence of LPA and its development control unit covering every jurisdiction of the community, many buildings have been erected illegally.

However, further investigation shows that the LPA right from the onset has been sidelined in the schemes of control of sand-digging. The sand-diggers' association relate to the local government council and ministry of commerce and industry. Any time the LPA attempts at checking the activities of sand-diggers, the later normally secure immunity by the permit they receive from the local council after payment of fees. This scenario is a common experience in Nigeria due to duplication of functions of ministries, parastatals and agencies and lack of coordination of governmental activities and operations.

From the foregoing, obstacles to good conservation include: (1) Poor legislation and organization of conservation at the policy making level; (2) The lack of environmental planning and rational use of resources; (3) Lack of training and basic environmental information; (4) Lack of support for conservation or environmental sustainability; and (5) Lack of coordination of government agencies in charge of environment related activities and operations. It is on this note that the over-exploited and heavily degraded living resources in Ado-Odo/Ota Local Government Area need urgent restoration strategies and policy.

MITIGATING ENVIRONMENTAL DEGRADATION THROUGH POLYCENTRIC ENVIRONMENTAL PLANNING IN NIGERIA

"You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete."

– Richard Buckminster Fuller.

In order to mitigate the identified environmental degradation and poverty in the studied communities, the adoption of polycentric environmental planning is recommended. Polycentric environmental planning relates to good environmental governance which regulates advancing technological development with the quality of the environment and the welfare of the people. The World Bank (1992) has defined good governance as the manner in which power is exercised in the management of a country's economic and social resources for development. It is seen as the overall management of resources for development - with a special emphasis on accountability, the legal framework for development, citizen participation and information dissemination and transparency.

Polycentric environmental planning becomes necessary in the light of the fact that social processes, mediated through the interaction between humans and their environment, generate unequal exposure to risk by making some people, group or community more prone to disaster than others. These inequalities are largely a function of power relations in every society (see Hilhorst and Bankoff 2004). In order to address these inequalities, citizens need to be politically enlightened and socio-economically empowered so as to: (a) know their rights; (b) defend their rights in a civil manner; (c) work together as colleagues to make meaningful contributions towards environmental protection and development; and (d) be active agents of positive change in the socioeconomic, technological, and political arenas. To this end, a strategy that can help in restructuring the public sphere for inclusive environmental polity in Ado-Odo/Ota LGA is imperative (see Akinola

2010a, 2011a). This is where the Institutional Analysis and Development (IAD) framework is instructive.

The Role of the IAD Framework in Appropriating Technological Devices to Environmentalism

Though the IAD framework was developed by political scientists to analyse and understand problems in human society, it has been found very relevant in several disciplines in diagnosing problems in various facets of human life. In particular, the tool is very useful to appropriating technological devises to environmentalism, construction and development.

Broadly defined, institutions are the prescriptions (rules) that humans use to organize all forms of repetitive and structured interactions including those within families, neighborhoods, markets, firms, sports leagues, churches, private associations, and governments at all scales. Institutions are essentially contained in a shared language to specify the action that are required, prohibited, or permitted, and the sanctions authorized against rule-infractions. They may facilitate or militate against stable relationships that make interdependence possible and productive for most individuals in the political economy (Commons 1968; E. Ostrom 2005:3,18).

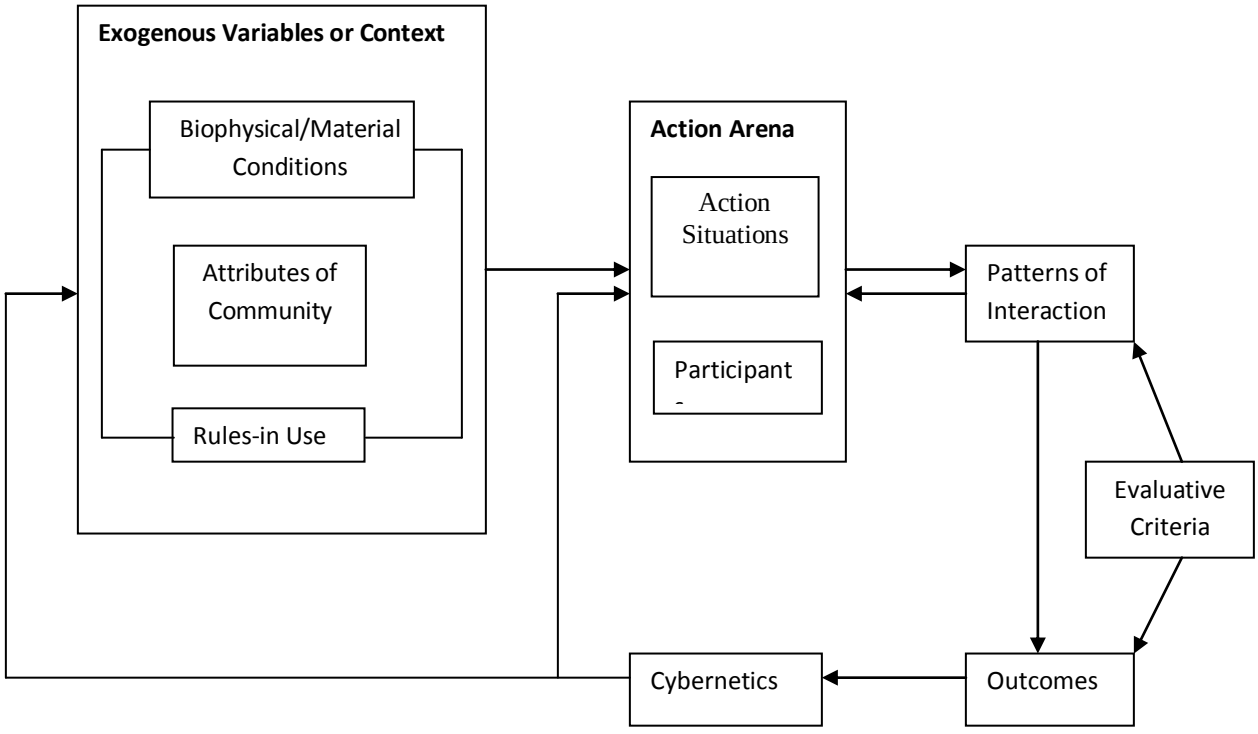

Fig. 1. A Framework for Institutional Analysis.
Source: Adapted from E. Ostrom, Gardner and Walker (1994:37).

As shown in Fig. 1, institutions are crafted by participants within action arenas in response to their particular exogenous variables. This normally starts when participants within an action arena respond to exogenous variables or context (biophysical/material conditions, cultural and other attributes of a community, and

rules-in-use) and when outcomes are positive, the participants will increase their commitment to maintain the structure as it is or to another set of exogenous variables and then on and on like that. However, if outcomes are negative, participants might raise some questions on why the outcomes are negative. They might then move to a different level and change their institutions to produce another set of interactions and consequently, different outcomes.

Since society is a system of human cooperation, people in any society should collectively relate to and deal with their exogenous variables. Exogenous variables are those conditions that affect human livelihoods and which humans have to work upon through appropriate environmental planning and institutional arrangements to better their conditions of existence. However, there are some fundamental imperatives of collective action within development arena. These are collegiality, mutual trust, reciprocity and shared community of understanding. The realisation of these imperatives through effective polycentric environmental planning and institutional arrangements can enable stakeholders in building construction to work together so as to achieve efficient and sustainable environmental development.

Without deliberate polycentric environmental planning, public intervention and polycentric institutional arrangements that can act as checks and balances on technological drives, uncontrolled technology will be self-suicidal to the society in terms of environmental degradation, and the interests of citizens will be abused. Consequently, unfettered business drives of capitalist bourgeoisies in building industry, especially in sand-digging, will maximise profit at the expense of the citizens in industrial corridor (see Akinola 2008q). Given this caveat, one major concern is appropriate technology in sand-digging that will contribute to sustainable environment. With polycentric environmental planning and public intervention arising from the moderating role played by development control of Local Planning Authority (LPA), certain degree of the negative impact of sand-digging would be internalized by industrialists which, invariably, would reduce environmental cost on society.

However, since political factor determines the operation of other sectors of the economy, restructuring the public sphere becomes central to resolving governance, environmental and developmental crisis. To this end, an African Public Sphere Restructuring Model (APSRM) is suggested for adoption in setting up self-governing community environmental assembly (SGCEA) for deliberation, collegiality, mutual trust, reciprocity and shared community of understanding to enable citizens, both elite and non-elite to operate in synergy to collectively achieve socio-economic, techno-political and environmental objectives. Without a restructuring of the public space that could enable all the diverse interests in the communities to operate as colleagues with equal standing such that environmental resources are rationally utilized and conserved environmental campaign would amount to a waste of time, energy and resources (see Akinola 2010a, 2011a).

Such cooperation requires deliberation and that is why deliberative democracy is considered more appropriate for Nigeria and Africa (Akinola 2011a). For example, one of the proud inheritances of South Africa's democracy is public dialogue in the form of community forums, negotiations, and *imbizo*[3].

[3] *Imbizo* is a word from the Zulu language in South Africa. It means a "gathering" for the purpose of discussing important matters within a group or community. Its ultimate purpose is to ensure participation of members in the process of conceptualising, making and executing decisions. The *imbizo,* in its traditional form, has constituted an important aspect of the indigenous African political system for many centuries, especially in Southern Africa (Hartslief, 2005:1).

Community forums have been part of social movements in the fight against both apartheid and post-apartheid inequalities. Negotiations proudly characterized the transition to democracy which is based on principles of nondiscrimination (Hartslief 2005:1). The equivalent of *imbizo* among the Yoruba of Western Nigeria is *igbimo ilu* (town court of legislators), *opuwari* among the Ijaw in Bayelsa State and *mbogho* among the Efik and Ibiobio of Cross River and Akwa Ibom States of Nigeria. It is high time Nigerians looked back in retrospect to learn from their roots by harnessing certain self-governing principles that are inherent in their cultural heritage to address rural-urban environmental challenges.

If we agree that institutions matter in terms of their influence on cooperation, then self-organizing and self-governing arrangements that the peoples of Nigeria and Africa have adopted in cooperating mutually in responding to their common problems are imperatives as a condition to be met for the attainment of good environmental governance. Recent indications support the fact that the peoples of Nigeria through self-organizing and self-governing arrangements have been responding appropriately to the needs and aspirations of the citizenry. By exploring pre-colonial governance heritage and practices elsewhere, the people have been able to respond to social challenges that the state has effectively dodged over the years. Considering the good performance of the local people through self-governing institutions[4] across Nigeria, local people in Ado-Odo/Ota LGA are capable of cooperating with one another to organize people-oriented environmental management programmes that will reduce vulnerability arsing from sand-digging.

It is this type of self-governing and self-organising local arrangement that can be integrated into the formal system of government at the local level in Nigeria. This, invariably, will lead to effective cooperation and deliberation between and among public officials, scholars, industrialists and citizens at community level, thereby eliminating gaps between the four groups. Following this is the adoption of Polycentric Planning and Poverty Reduction Strategy (PPPRS) to reduce vulnerability arising from sand-digging at the community level. Using PPPRS, African Polycentric Sustainable Environment Model (APSEM) is adopted (Fig. 2).

African Polycentric Sustainable Environment Model (APSEM)

African Polycentric Sustainable Environment Model (APSEM) is designed for conserving and protecting environmental resources (Akinola 2009b:96, 2008q:66-67) (Fig. 2). APSEM is adopted for reducing vulnerability in sand-digging. The model derives inspirations and working mechanisms from four models and they are: (i) African Public Sphere Restructuring Model (APSRM) (Akinola 2010a, 2011a); (ii) African Polycentric Information Networking (APIN) (Akinola 2009b:94, 2011e:67); (iii) African Community-Initiatives and Development Model (ACID) (Akinola 2000:186-187, 2009b:97, 2011e:68-69) and (iv) African Polycentric Forest Management Model (APFMM) (Akinola 2007i:126-127). As shown in the first part of Fig. 2, free riding on the part of sand-diggers is a major

[4] Self-governing institutions (SGIs) are institutions crafted by the people, without external interference, in an attempt to solve their common problems within their locality or community. They are also called people-oriented, people-centered or community-based institutions (see V. Ostrom 1994, 1997, 2000; E. Ostrom 1990, 1999; E. Ostrom, J. Walker, and R. Gardner 1992; E. Ostrom and V. Ostrom 2003; Wunsch and Olowu 1995; Mc Ginnis 1999a; Ayo 2002; Olowu, 1999, 2006; Olowu and Wunsch 2004; Gellar 2005; Sawyer 2005; Akinola 2005d, 2008b, 2009a,b, 2010a,i, 2011a).

factor that is engendering environmental degradation in Ado-Odo/Ota communities. Consequently, degreening, forest depletion, erosion, global warming, flooding, environmental poverty, diseases, death, etc. become the order of the day.

The second part of the model, as shown in Fig. 2, attempts at synergizing the efforts of stakeholders/participants (government, industry, scholars, NGOs, youth and self-governing institutions) within environmental arena. By adopting the African Public Sphere Restructuring Model (APSRM) and the African Polycentric Information Networking (APIN), the restructuring process will commence (first step in restructuring process) with the design of polycentric sustainable environmental mechanism (PSEM) by scholars and public officials, and the setting up of self-governing community environmental assembly (SGCEA) where stakeholders through their institutions can operate in synergy.

African Public Sphere Restructuring Model

African Public Sphere Restructuring Model (APSRM) is conceptualised as a deliberate act of setting up self-governing community assembly (SGCA) for deliberation, collegiality, mutual trust, reciprocity and shared community of understanding (2010a:73-78, 2011a:40-47, 2011e:66). The model contends that, since political factor determines the operation of other sectors of economy, the starting point is to commence with the application of strategies that can restructure the public sphere in the Niger Delta so that socio-economic and technological crisis in the region can be addressed on pilot scales. The model addresses reconstruction and reconfiguration of the public sphere in Africa to synergize the efforts of the people through their institutions and that of governments to resolve the lingering socio-economic crises and poverty. At the same time, it charts a course of action on how citizens at community level can be mainstreamed in decision making, rule-monitoring and enforcement of sanction on rule infraction. APSRM emphasises two elements – deliberation and deliberateness/action (2010a:73-78, 2011a:40-47, 2011e:66).

African Polycentric Information Networking (APIN)

The application of APIN would strengthen linkages and interactions between individuals and self-governing institutions. This would help in addressing the problem of information asymmetry, which is a major factor that strengthens "prisoner's dilemma" and "tragedy of the commons. The beauty of polycentricity is in its multifarious connections and interactive links that all members of a particular community have to receive information, interact and make contributions to decision-making and conflict resolution. For example, decision taken or information passed in a polycentric system has the possibility of reaching every member of a community through, at least, four of eight channels. The linkages and interactions can be connected to the state structure of governance for information dissemination from state to local/community levels (see Akinola 2009b:94, 2011e:67).

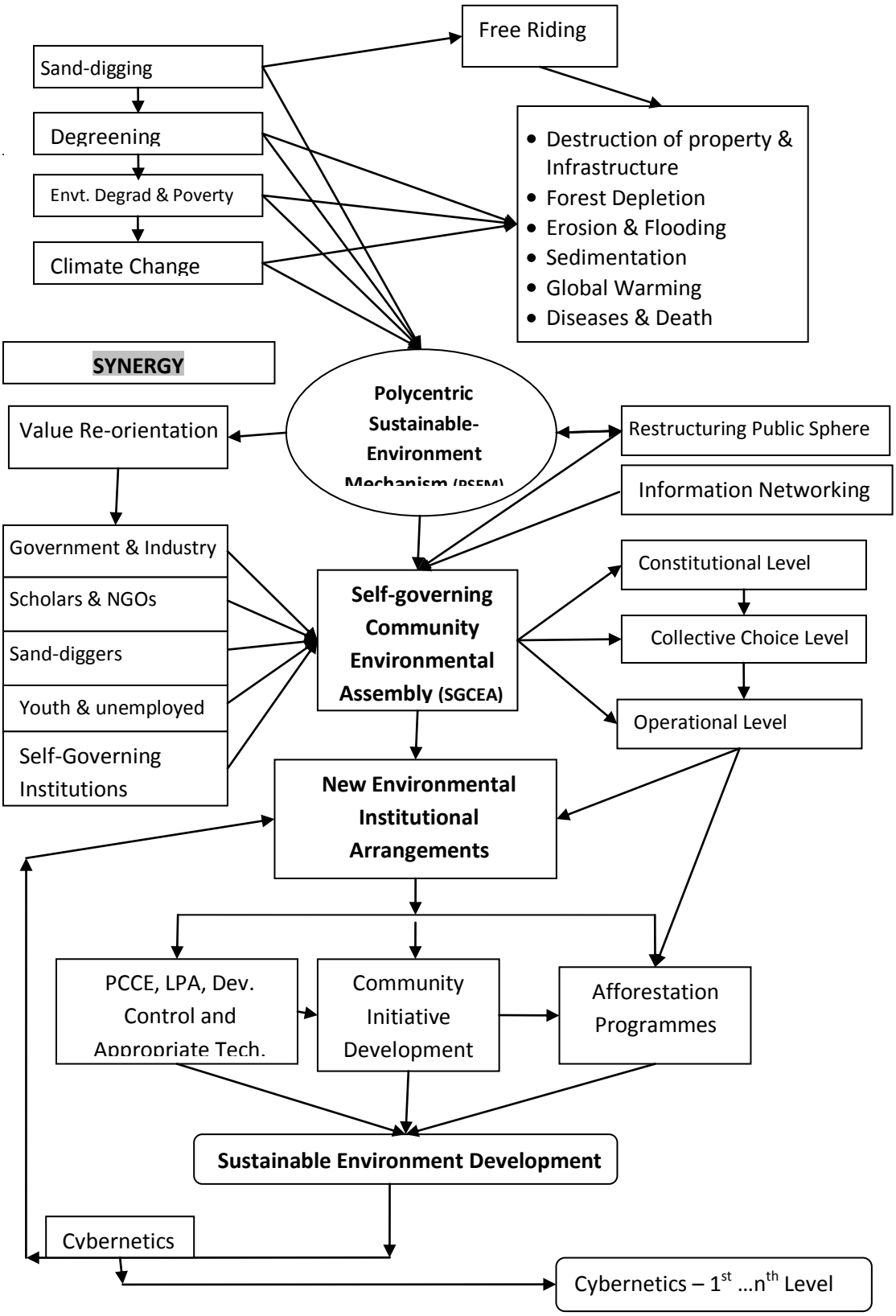

Fig. 2: African Polycentric Sustainable Environment Model (APSEM)
Source: Adopted from Akinola (2009b:96; 2011e:62,68)

Self-Governing Community Environmental Assembly (SGCEA), Civic Enlightenment and Citizens' Responsibilities/Tasks

The SGCEA should be patterned after *imbizo, igbimo ilu, opuwari* and *mbogho* but modified to include representatives of governments with their agencies, higher institutions, community institutions, occupational groups, women groups, youth, etc.). Since SGCEA is a multi-tasks assembly, one of its operations will have to do with education and enlightenment of citizens so that public officials and the people operate within shared communities of understanding. When citizens are able to realize that they can and should take full responsibilities in shaping and re-shaping their environment to suit their daily aspirations and yearnings through active and constructive interjections, then shared communities of understanding would be established.

It should be pointed out that environmental management is best coordinated at local level. Hence, environmental management programmes should be decentralized to local governments. It is also important at this juncture to point out that the Nigerian LG system as presently constituted is not people-oriented. Rather, it is a reflection of centralized federal government; more or less a field administration. The type of LG system that can deliver results to the citizenry should be self-governing and structured polycentrically. In a polycentric system, all interests and occupational groups that exist within the local government area should be recognized, while leaders of these groups should be part of SGCEA. The first task before the assembly is to share views and values of all the groups/interests. Among the issues to be discussed are: the importance of environmental resources to all the interest groups; the implications of environmental degradation; the contributions of each group towards resources regeneration and afforestation; and tasks and responsibilities that each group should carry out for effective environmental management.

Natural resources constitute the platform upon which socio-economic activities and survival of man hinge. Extracting and processing of natural resources are major activities of development projects. However, if resources are depleted or degraded, the welfare of man automatically plummets and development becomes difficult to sustain since the welfare of citizens is an important index in development. Two major tools of SGCEA are Public Complaints Commission for Environment (PCCE) and Environmental Cost Internalization (ECI). There is the need for the establishment of Public Complaints Commission for the Environment (PCCE), independent of the Federal Ministry of Environment at the federal, state and local government levels.

The PCCE will be a monitoring body that should comprise representatives from Federal Ministry of Environment, Town Planning Registration Council (TOPREC), Architects Registration Council of Nigeria (ARCON), Estate Surveyors and Valuers Registration Board of Nigeria (ESVARBON), Council of Registration Building of Nigeria (CORBON), Quantity Surveyor's Registration Board of Nigeria (QSRBN), Council of Registered Engineers of Nigeria (COREN), environmental related Non-governmental Organisations (NGO) and community institutions. The PCCE at all levels of government are to monitor the activities of all development projects for a clean, safe and healthy environment and prosecute non-compliance. The monitoring group is crucial at this critical time because monitoring and enforcement of environmental standards have been identified by the World Bank as major problems confronting the realization of a clean, safe and healthy environment.

These tools will ensure stakeholders to jointly take decisions, monitor industrial activities and ensure that all industries comply with Environmental Impact Assessment (EIA) standards. In order to achieve this, it is

imperative to adopt environmental governance that balances the equation of environmental resources utilization among the stakeholders in the environment. An important tool for achieving this objective is the design and implementation of people-oriented EIA. The government should make the preparation of Environmental Impact Assessment Report (EIAR) mandatory for all existing and future projects and programmes. The government should, also enforce compliance with EIA decree, especially in conjunction with the appropriate and recognized professionals that should prepare EIA documents. It is also suggested that "the polluters pay legislation" should be enforced and adequate compensation be paid to victims at the appropriate time.

The PCCE should ensure that EIAs of all development projects are prepared and companies concerned made to address all the problems their operations have caused on local communities. The Commission should also ensure that part of revenue generated from industries should be used for reclamation of derelict land and to provide health facilities and job opportunities for the affected communities. In implementation of this strategy, it is necessary to survey industrial premises so as to:

1. Show the different types of pollution being released by different types of industrial activities at the community level.
2. Reveal the gaps that exist as a result of lack of enforcement of and/or non-compliance with environmental standards within the industrial premises in the country.
3. Convince the industrialists of the need to pay for environmental hazards that their operations have engendered.
4. Guide the decision makers on how to reclaim derelict land and to package and locate health facilities for the affected citizens within the industrial premises.

It is important that all sand-digging industries be made to pay for pollution, and legislation passed to generate revenues from all industries. The process of implementing "'polluters pay legislation', health and welfare of citizens" is in six stages as discussed elsewhere (Akinola 2008q:66-69).

The second step in the restructuring process is a value re-orientation among stakeholders. This new orientation, invariably, determines: (a) the ability of public officials and scholars to study diverse environmental activities on resources extraction that are going on in the communities and identify all sorts of free-riding and exclusions; (b) the synergy between and among all participants within the environment; (c) the relevance and indispensability of community self-governing institutions in environmental management; and (d) the centrality and imperativeness of community assembly for environmentalism.

The technical environment should provide the tools and knowledge, which define how environmental resources should be harnessed and used as factors of production. The institutional environment should define who controls the resources and how the technique would be applied. In this wise, the process of environmental governance would involve both the government and the people in planning, utilization and management of environmental resources.

Third, the participants would operate using rules that are crafted by members at the SGCEA. Rule crafting takes place at three levels – constitutional, collective choice and operational. At the constitutional level lies the system that determines how rules are made and can be modified. At the heart of effective environmental management is the imperativeness of constitutional reform which can be accomplished through pragmatic experience. The adoption of polycentric environmental strategy could avail the citizens the opportunities to dialogue in community assembly and

jointly take decisions on environmental management. At the collective choice level, rules that define and constrain the actions of individuals and citizens in environmental matters have to be established. At the operational level, concrete actions have to be undertaken by those individuals most directly affected (community members, sand-diggers, farmers, lumberers, local harvesters, etc.).

Fourth, the outcome of the restructuring is emergence of new environmental institutional arrangements, which would reflect integrative constitutional order in environmental conservation and management. It is this joint action and synergy by these groups that would eventually determine how government policies on resources extraction, drainage, waste management, aforestation and harvesting techniques are to be implemented. After the institutional arrangement has been designed, operational strategy for implementation of environmental matters would be fashioned out.

For the purpose of implementation, two models are applied and they are: (1) African Community-Initiatives and Development Model (ACID) and (2) African Polycentric Forest Management Model (APFMM). The application of these models would lead to sustainable environmental development. However, there is the need to set up a feedback system called cybernetics that would help in refining the operational strategies. This would be carried out from time to time (from 1st level to nth level). It is believed that if these suggestions are taken into consideration, a responsive policy on environmental governance would emerge and a shared community of understanding among the stakeholders necessary for good environmental governance would lay the foundation for sustainable environmental management that would conserve and protect environmental resources in the study area.

African Community-Initiatives and Development Model (ACID)

African Community-Initiatives and Development Model (ACID) designs institutional arrangements that synergise the efforts of governments and local institutions in the provision and production of infrastructure and services at the community level. Invariably, it helps in empowering the people economically and reducing poverty. The ACID suggests that the governments and industries should relate directly with these people-oriented institutions. Using certain criteria such as (1) geographical location, (2) size, (3) completed projects, (4) on-going projects, and (5) future projects (in order of priority), government should identify active communities with self-help projects and pay them directly as suggested here. The model suggests that the federal government should start with communities with completed projects by paying such communities between 65.0% and 70.0% of the project cost. Akinola in 2000 suggested the proposed scheme of contribution between the people and the government (Akinola 2000:186-187, 2009b:97, 2011d:259).

In addition, four things need to be done: (1) compensation for the affected people; (2) reclamation or renovation of derelict land; (3) control of sand-digging operations; and (4) Financial allocation formula that will reflect/address the needs of the affected communities has been designed and can be found elsewhere (for details see Akinola, 1992, 2000; Akinola and Adesopo, 2011d). The application of this model would, invariably, help in empowering local people to defend spoilage of infrastructure by any industry or individuals as local people can claim ownership of such infrastructure.

African Polycentric Forest Management Model (APFMM)

African Polycentric Forest Management Model (APFMM) is designed for preserving and sustaining forest resources (Akinola 2007i). Since this model is an integral part of African Polycentric Sustainable Environment Model (APSEM), its details may not be necessary so as to conserve space. It is important that the self-governing community forestry assembly (SGCFA) assembly set up a committee to decide on two main issues and they are: (a) Area of forest forbidden to enter (reserved area). This area would be created after depopulation of Lagos. (b) Area of forest earmarked for usage after a certain period of years, say, 25-30 years. The reason for suggesting this period of years (25-30 years) is because the period is considered long enough for natural regeneration of forest.

PCCE, Local Planning Authority, Development Control and Appropriate Technology for Sustainable Environment

There is a growing consensus on the fact that without a deliberate public intervention and polycentric planning, technology and industrial activities will invariably pose significant danger on the wellbeing of humans and environment (Rawls, 1972:60; World Bank, 1992:10; Oyeshola, 1995:61; Akinola 1992, 1998, 2003a, 2008q). Given this caveat, appropriate technology that can harmonise technology to cultural and environmental settings are imperatives. Appropriate technology reduces adverse consequences of technology and technological devices on the environment, thus making the environmental resources sustainable assets for the future generation. Environmental resources we use today are borrowed from future generation, hence the need for prudency in the ways and manners they are harnessed and utilised.

Apart from the fact that appropriate technologies are culture-friendly and gender sensitive, they are less advanced and less complicated, and to the extent, easily adaptable and understood by the relatively less skilled labour force of the rural setting. We must start from somewhere beginning with our own initiatives. Technology, all over the world, is built on indigenous knowledge. It is on this foundation that lessons from other technologically advanced societies are built through adaptation strategy. The promotion of appropriate technologies for all sectors of Nigerian economy is a *sine qua nom* for poverty reduction and sustainable development (Akinola 2002, 2008q). With the introduction of the proposed PCCE, the Local Planning Authority (LPA) should be rebranded and funded to embark on effective development control.

The model suggests that the key stakeholders should operate as colleagues with equal standing in rule making, policy formulation, design, execution and maintenance of environmental friendly projects as well as for early warning system. It is also apposite at this juncture to emphasise that the language that is clearly understood by the people should be used in all interactions and activities during the implementation.

If we are to avoid self-destruction, we must think ecologically, develop ethical relationship between man and his environment, and act with the consciousness of earth's finite resources. In this respect, Environmental Impact Assessment serves as a check on human activities in manipulating the environment. In order to mitigate these impacts, accountability and transparency of decision makers, as prerequisites of good governance, need be demonstrated.

CONCLUSION

This paper concludes that sand-digging and soil excavation for development projects in Ado-Odo/Ota LGA engender environmental degradation. In order to protect the environment against abuse and degradation, polycentric environmental planning that is capable of synergising the efforts of stakeholders should be adopted. By bringing all the stakeholders in building/construction industry and environment (governments, scholars, industrialists, environment related non-governmental organizations and representatives of local communities) together to deliberate and take decisions jointly and regularly, the hitherto gaps between the stakeholders will be reduced. Consequently, implementation of EIA and enforcement of environmental standards will become easier.

Using Polycentric Planning and Poverty Reduction Strategy (PPPRS), African Polycentric Sustainable Environment Model (APSEM) is adopted for restructuring decision making on environment to conserve and protect environmental resources, especially by reducing vulnerability in sand-digging. The model derives inspirations and working mechanisms from four models: (i) African Public Sphere Restructuring Model (APSRM), (ii) African Polycentric Information Networking (APIN), (iii) African Community-Initiatives and Development Model (ACID) and (iv) African Polycentric Forest Management Model (APFMM). The restructuring process will commence with the design of polycentric sustainable environmental mechanism (PSEM) by scholars and public officials, and the setting up of self-governing community environmental assembly (SGCEA) where stakeholders through their institutions can operate in synergy.

Two major tools of SGCEA are Public Complaints Commission for Environment (PCCE) and Environmental Cost Internalization (ECI). These tools will ensure stakeholders to jointly take decisions, monitor industrial activities and ensure that all industries comply with Environmental Impact Assessment (EIA) standards. If we are to avoid self-destruction, we must think ecologically, develop ethical relationship between man and his environment, and act with the consciousness of earth's finite resources. In this respect, Environmental Impact Assessment serves as a check on human activities in manipulating the environment. With the introduction of the proposed PCCE, the Local Planning Authority (LPA) should be rebranded and funded to embark on effective development control on sand-digging and soil excavation as well as other building, construction and industrial activities in Ado-Odo/Ota LGA and in Nigeria.

REFERENCES

Adekunle Aliyu (2008). "Nigeria is Off Track On MDGs." Vanguard (Lagos), 21 April 2008, http://allafrica.com/stories/200804220017.html (accessed 23/04/2008).

Ajibola, M.O. (2009) An Economic Valuation of Wetland Benefits in Nigeria: A case study of Ogun River Basin. A Ph.D Research Proposal Submitted to the Department of Estate Management, Covenant University, Ota, Ogun State, Nigeria.

Akinola, S. R. (1992): "Governance and the Deprived Group: A Case from Oil Producing Region of Nigeria". Journal of Nigerian Public Administration and Management, Vol. 2, No. 2, pp. 68-77.

_____ (1997). "Environmental Impact of Gold Mining on the Local Community in Ijesha Region, Osun State, Nigeria", Ife Research Publications in Geography, Obafemi Awolowo University, Ile-Ife, Vol. 6, Nos. 1 & 2, p. 133-138.

_____ and Awotona, A. (1997): "The Impact of Road Construction on the Local Environment in Nigeria: A Case of Road Projects in Osun State, Nigeria", in Meyer, Peter B. and Lyons, Thomas S. (Eds.) The Small City and Regional Community, University of Louisville, Kentucky, U.S.A., pp. 191-202.

_____ (1998): "Oil Prospecting, National Integration (Unity) and Sustainable Development in Nigeria", in: Obidi, S. S.; Afolabi, E. R. I.; Adedibu, M. A. and Kobiowu, S. V. (Eds.) Book of Readings on Education, Environment and Sustainable National Development, (Ibadan, Cardinal Crest Limited), pp. 285-296.

_____ (1999): "Environmental Impact and Poverty Indicator of Transporting Dangerous Materials in Nigeria: A Case of Ojoo T-Junction, Ibadan, Oyo State", paper prepared for an International Conference on the Transportation of Dangerous Materials, organised by the Nigerian Institute of Transport Technology, (NITT), Sheraton Hotel and Towers, Abuja, 20 - 24 September, 1999.

_____ (2000) Balancing the equation of governance at the grassroots, in: Adebayo Adedeji and Bamidele Ayo (eds.) People-Centred Democracy in Nigeria? The Search for Alternative Systems of Governance at the Grassroots, (Ibadan, Heinemann Educational Books [Nigeria] Plc.), pp. 171-197.

_____ (2002). 'University education, appropriate technologies and poverty reduction in Nigeria: The missing link', Proceedings of a Regional Workshop on Promotion of Appropriate Agro-Processing Technologies in West Africa, Obafemi Awolowo University, Ile-Ife, 2002, pp. 69-78.

_____ (2003) "Resolving the Niger – Delta Crises through Polycentric Governance in Nigeria", Paper presented at a Colloquium organized by the Workshop in Political Theory and Policy Analysis, Indiana University, Bloomington, USA, December 1, 2003.

_____(2005d). "Structural Transformation and Polycentric Governance: Complementary Strategy towards Nigeria's Reform Agenda". Proceedings of the 14th General Assembly of Social Science Academy of Nigeria, Abuja, Nigeria, pp. 238-250.

_____(2007f). Knowledge Generation, Political Actions and African Development: A Polycentric Approach. International Journal of African Renaissance Studies, 2(2):217–238.

_____ (2007i). "Land Use Decree, Forest Administration and Governance

Crises in Nigeria." GIMPA Journal of Leadership, Management and Administration. Greehhill, Vol. 5, No. 1, June 2007, pp. 109-130.

_____(2008b). Coping With Social Deprivation through Self-Governing Institutions in Oil Communities of Nigeria. *Africa Today* 55(1):89–107.

_____(2008q). "Reducing Environmental Degradation and Poverty through Environmental Governance in Nigeria", in S. Padmaja, N.C. Gautam and Mohd. Akhter Ali (eds.) Environmental Impact Assessment Studies and Planning Perspectives, BS Publications, 4-4-309, Giriraj Lane, SultanBazar, Hyderabad, 29 A.P., pp. 41-74.

_____(2009b). "Polycentric Planning and Community Self-Governance as Panacea to the Niger Delta Crisis." African Journal of Development (AJD). New York University, USA, Vol. 11, No. 2, pp. 79-104.

_____(2010a). "Restructuring the Public Sphere for Social Order in the Niger Delta through Polycentric Planning: What Lessons For Africa?" Journal of African Asian Studies, Vol. 9, Nos. 1-2. Cornell University, Ithaca, NY, USA, pp. 55-82.

_____(2011a). "Restructuring the Public Sphere for Democratic Governance and Development in Africa: The Polycentric Planning Approach." In Abdalla Bujra (ed.). Political Culture, Governance and the State in Africa. Development Policy Management Forum (DPMF), Nairobi, Kenya, pp. 1-61.

_____(2011b). "Community Self-Governance as a Panacea for Environmental and Social Injustice in the Niger-Delta of Nigeria." Akin Alao and Rotimi Taiwo (eds.). (Chapter 12). In Akin Alao and Rotimi Taiwo (eds.), *Perspectives on African Studies: Essays in Honour of Toyin Falola.* LINCOM Europa (Lincom Academic Publishers), LINCOM GmbH, Gmunder Str. 35, D-81379 München, GERMANY, pp. 220- 248.

_____ and Adesopo, A. (2011d) "Derivation Principle Dilemma and National (Dis)Unity in Nigeria: A Polycentric Planning Perspective on the Niger Delta." *Journal of Sustainable Development, Canadian Center of Science and Education.* Vol. 4, No. 5, October 2011, pp. 251-263.

_____ (2011e) "Post-Amnesty Plan, Peace-Building and People-Centred Development in the Niger Delta: A Polycentric Planning and Poverty Reduction Strategy (PPPRS)" *Journal of Sustainable Development and Environmental Protection*, Vol. 1, No. 2, pp. 52-75.

_____ (2012). (Accepted and Forthcoming 2011). "Overcoming Tyranny and Underdevelopment in the Niger Delta through Appropriate Human Resources Development and Utilization." In Okechukwu Ukaga, Ukoha Ukiwo & Ibaba S. Ibaba (eds.). Natural Resources*, Conflict and Sustainable Development: Lessons from the Niger Delta,* Routledge, Taylor & Francis Group, New York, USA.

Ayittez, G. B. N. (1991). *Indigenous African Institutions.* New York: Transnational Publishers.

_____(2006). *Africa Unchained: The Blueprint for Africa's Future.* Palgrave Macmillan, USA, ISBN: 978-1-4039-7386-3; ISBN-10: 1-4039-7386-5. http://www.shvoong.com/books/1783537-africa-unchained-blueprint-africa-future/ (accessed May 5, 2009).

Ayo, S.B. (2002). Public Administration and the Conduct of Community Affairs Among the Yoruba in Nigeria. Workshop in Political Theory and Policy Analysis, Indiana University,

Bloomington, Indiana, Institute for Contemporary Studies, Oakland, California.

Ayodele, A. S. and Nweke, G. A. (1987): "Energy Primary Resources: The World and Nigeria", in A. S. Ayodele (ed.): Energy Development and Utilization in Nigeria, NISER, Ibadan, pp.10 -13.

Barbier, E.B. (1991). An approach to economic valuation of tropical wetlands: with examples from Guatemala and Nicaragua. In Girvan and Simons (eds), *Caribbean Ecology and Economics*. St. Michael, Barbados: Caribbean Conservation Association.

Barbier, E.B., Acreman, M. and Knowler, D. (1997) *Economic Valuation of Wetlands: A guide for policy makers and planners*. Ramsar Convention Bureau, Gland, Switzerland.

Blackstones, W. T. (ed.) (1974): Philosophy and Environmental Crisis, University of Georgia Press, Athens.

Boele, R. (1995) Ogoni: Report of the UNPO Mission to Investigate the Situation of the Ogoni of Nigeria. February 17-26, 1995. The Hague: Unrepresented Nations and Peoples Organization.

Brenda, C. (1948): Land and Landscape, John Murray, London, pp. 9.

Calder, R. (1970): "Mortgaging the Old Homestead", Foreign Affairs, Vol. 48, Nos. 2, pp. 207 - 220.

Chandler, W. U. (1990): "Development and Environmental Change", A Quarterly Review of World Economics, Economic Impact, Huston Summit Issues, no. 71, 1990/2, pp. 18-25.

Commoner, B. (1971): The Closing Circle, N. Y. Alfred Knopf, pp. 178.

Commons, John R. (1968): Legal Foundations of Capitalism. Madison: University of Wisconsin Press. First Published in 1924.

Cohen, Barney (2004). "Urban Growth in Developing Countries: A Review of Current Trends and a Caution Regarding Existing Forecasts." World Development, Vol. 32, No. 1, pp. 23–51, Elsevier Ltd. Great Britain. www.elsevier.com/locate/worlddev.

Dahl, T.E. and G. J. Allord. (1990) "Technical Aspects of Wetlands History of Wetlands in the Conterminous United States" National Water Summary on Wetland Resources, United State Geological Survey Water Supply 2425 12. Natural Resources Protective Association, Importance of Wetlands. http://www.nrpa.com/wetlands.htm

Dawson, J. A. & Doornkamp, J. C. (1973): Evaluating the Human Environment, Edward Arnold (Publishers) Ltd., London.

de Groot, R, (2007) Workbook Module 2 on Wetland Valuation. Wetland International.

Esparza, L. and M. Wilson (1999) "Oil for Nothing: Multinational Corporations, Environmental Destruction, Death and Impunity in the Niger-Delta." A US Non-governmental Delegation Trip Report, September 6-20.

Federal Environmental Protection Agency (FEPA) (1991): National Interim Guidelines and Standards for Industrial Effluents, Gaseous Emissions and Hazardous Wastes Management in Nigeria, Federal Ministry of Works and Housing, Lagos.

Federal Republic of Nigeria (1992). Urban and Regional Planning Decree (No. 88), 1992, Official Gazette, No. 75, vol.79, Lagos; Government Press.

Forester, J. (1971): *World Dynamics*. Wright Allen Press.

Greb, S.F, and W.A. DiMichele eds. (2006) Wetlands Through Time. The

Geological Society of America. Special Paper 399.

Hartslief, O. (2005). The South African Presidential Participation Programme (Presidential Imbizo): Engaging Communities for a Better Life. An unpublished paper, 2005. (http://www.engagingcommunities2005.org/abstracts/S14-hartslief-o.html), Accessed May 25, 2009.

Hilhorst, D. and Bankoff, G. (2004). 'Mapping Vulnerability'. In G. Bankoff, G. Frerks and D. Hilhorst (eds.). Mapping Vulnerability: Disaster, Development and People. London: Earthscan.

International Centre for Economic Growth (1996): Policies and Programs for Social and Human Development. A handbook produced for the United Nations World Summit for Social Development.

IUCN Commission on Environmental Law (1991): Draft 4: Covenant on Environmental Conservation and Sustainable Use of Natural Resources, International Union for the Conservation of Nature and Natural Resources (IUCN), Bonn, Germany.

Larson, J.S., Adamus, P.R. and Clairain. E.J. (1989) Functional Assessment of Freshwater Wetlands: A Manual and Training Outline. University of Massachusetts, Amherst.

Leitmann, J. (2005). Sustaining Cities – Environmental Planning and Management in Urban design. PP.78. McGraw-Hill.

Meadows, D. H.; Meadows, D. L.; Rander, J. and Behvens, W. (1972): The Limits of Growth, University Book, N. Y.

Mesarovic, M. and Pestel, E. (1974): Mankind at the Turning Point, The Second Report to the Club of Rome, Reader's Digest Press, N.Y.

McGinnis, M. D. (1999a). *Polycentric Governance and Development: Readings from the Workshop in Political Theory and Policy Analysis*. Ann Arbor: The University of Michigan Press.

Mitsch, W. J. and J. G. Gosselink. (2000) *Wetlands*, third edition. New York: Wiley.

National Concord of Nigeria, (1982): Concord Business, Friday 17th. p. 3.

Obi, Cyril I. (1999) "Globalization and Environmental Conflict in Africa." African Journal of Political Science, (New Series) 4 (1).

_____ (2004) "Globalization in Nigeria's Oil Industry: Implications for Local Politics." In Agbaje, A. A. B, L. Diamond, E. Onwudiwe (eds.) Nigeria's Struggle for Democracy and Good Governance: A Festschrift for Oyeleye Oyediran. Ibadan: University Press, pp.441-459.

Okidi, C. O. (1993): Environment and Development in Africa: Policy Initiatives, African Centre for Technology Studies, Nairobi, Kenya.

Olowu, Dele. (1999). "Local Organizations and Development: The African Experience", Polycentric Governance and Development: Readings from the Workshop in Political Theory and Policy Analysis. Ann Arbor: The University of Michigan Press, pp. 209-240.

_____ (2006). "Towards a local governance and poverty reduction programme at the African Development Bank." In Millett, Karin, Olowu Dele & Cameroon Robert (eds.). Local Governance and Poverty Reduction in Africa. ADB, IMF & The World Bank. Published for the Joint Africa Institute, pp. 7-28.

Omoweh, A. D. (1993) "The role of shell petroleum development company and the state in the underdevelopment of the Niger Delta of Nigeria: 1937-1987," Ph. D.

Thesis, Obafemi Awolowo University, Ile-Ife, Nigeria.

Ostrom, Elinor. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. New York: Cambridge University Press.

Ostrom, E. (1992). "The Rudiments of a Theory of the Origins, Survival and Performance of Common-Property Institutions." In Bromley, Daniel W. (ed.). Making the Commons Work: Theory, Practice and Policy. San Francisco, California: Institute for Contemporary Studies. pp. 293-318.

_____(1999). "Self-Governance and Forest Resources." Occasional Paper, No. 20. Bogor, Indonesia: Center for International Forestry Research.

_____ (2005) Understanding Institutional Diversity. Princeton and Oxford: Princeton University Press.

Ostrom, Elinor, James Walker, and Roy Gardner. (1992). "Covenants with and without a Sword: Self-Governance is Possible." American Political Science Review. Vol. 86, No. 2, pp. 404-417.

Ostrom, Elinor, Roy Gardner, and James Walker. (1994). Rules, Games and Common-Pool Resources. Ann Arbor: University of Michigan Press.

Ostrom, V. and E. Ostrom (2003). Rethinking Institutional Analysis: Interviews with Vincent and Elinor Ostrom. Commemorating a Lifetime of Achievement, Mercatus Centre, George Mason University, USA, November 7, 2003.

Ostrom, V. (1994). The Meaning of American Federalism: Constituting a Self-Governing Society. San Francisco: Institute for Contemporary Studies Press.

_____ (1997). The Meaning of Democracy and the Vulnerability of Democracies. Ann Arbor: The University of Michigan Press.

_____(2000). The Meaning of Democracy and the Vulnerability of Democracies: A Response to Tocqueville's Challenge. An Arbor: The University of Michigan Press.

Oyeshola, D. (1995): Essentials of Environmental Issues: The World and Nigeria Perspective, Daily Graphics Ltd., Ibadan, Nigeria.

Rawls, J. (1972): A Theory of Justice, Oxford University Press, Oxford.

Robinson, D. (1996) Ogoni: the Struggle Continues. Geneva and Nairobi: World Council of Churches and all Africa Conference of Churches.

Rowell, A. (1994) "Shell-Shocked: The Environmental and Social Costs of Living with Shell in Nigeria." Greenpeace.

Satterthwaite, David, Gordon McGranahan and Cecilia Tacoli (2010). "Urbanization and its Implications for Food and Farming." International Institute for Environment and Development (IIED), Phil. Trans. R. Soc. Phil. Trans. R. Soc. B (2010) 365, 2809-2820

Tocqueville, A. (1966). Democracy in America, Vols.1&2, Phillips Bradley, ed. New York: Vintage Books. First Published in 1835 and 1940.

Ujoh, F, I. D. Kwabe and O. O. Ifatimehin (2009): Understanding urban sprawl in the Federal Capital Territories.

Wathern, P. (ed.) (1994): Environmental Impact Assessment: Theory and Practice. Routtledge, London and New York.

West, Charles (1975): "Some Theological Reflections on Justice Within the Limits of the Created World", in The Ecumenical Review, 27(1).

Williams, M. (1993): "Re-articulating the Third World Coalition: the Role of the Environmental Agenda," Third World Quarterly, 14(1).

Woodward, R.T., and Wui, Y.S. (2001) *The Economic Value of Wetland Services*: A Meta-Analysis. Ecological Economics 37, 257-70.

World Bank (1992): Governance and Development, The International Bank for Reconstruction and Development, The World Bank, Washington, D. C.

World Bank (1992): The World Bank and the Environment, Washington, District of Columbia.

World Commission on Environment and Development (1987): Our common future. Oxford University Press, New York.

Wunsch, James S. and Dele Olowu. (1995). The Failure of the Centralised State: Institutions and Self-Governance in Africa. Boulder, Colorado: Westview Press

.