

# Review of Environmental Management Practices for Paradigmatic Shift Concerning Environmental Sustainability in Nigeria

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## Abstract

*This paper discusses the links among environmental management practices and sustainable development and presents a framework that extends to paradigmatic shift about policy domain that generates environmental pressures, creating changes in the state of the environment and eventually contributing to human exposures. The paper further discusses impacts of poor environmental management on sustainability, environmental challenges on sustainable development and environmental considerations about solid waste management practices. The implications of current environmental resource constraints were termed harbingers of increased pressure on natural resources and thus the need for a shift to an economic model that values resource productivity much more highly. For developing countries, such as Nigeria, a vital issue of economic, social and environmental sustainability is to be achieved through proper environmental management.*

**Key words:** Environment, Management, Practice, Sustainability and Development

## Introduction

Utilization of the natural resources by humanity needs to take 'Sustainability/Conservation' in to consideration, which is referring to the management practices mainly for economic reasons of such valued environmental resources as timber, fish, game, topsoil, pastureland, minerals and to the preservation of forest (Abdullah & Santa Cruz, 2009). Human beings and indeed, livestock and wildlife, as well, enjoy the right to share in the resources of the earth. Man's mismanagement of any resource such as water, air, land and soil, as well as other living creatures such as plants and animals may not augur well with sustainability and environmental friendliness.

Apparently, the surroundings in which we and all living creatures live should be understood as our environment. Environmental Pollution, on the other hand, means the dirtying and spoiling of natural surroundings. The air is polluted (National Geographic, 2014a); the seas are polluted (Young People's Trust for the Environment (YPTE), (2014); ozone layer is diminishing, allowing the ultraviolet radiation to earth surface (Anwar *et al.*,

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2016); different animal species becoming extinct or endangered (The learning zone, 2014); and the devastation of our forest lands (National Geographic, 2014b). In another vein, social environment pollution (Raja, 2014); worldwide poverty and famine (World Hunger Education Service, 2014); deprivation of human rights (Jiloha, 2010); homelessness and migration problems (Feantsa.org, 2014); racism (Global Issues, 2014); abandoned children (Fuchs, 2017) to mention but a few, are observed to be rampant in our environment. Similarly, almost 90 % of the world has access to basic water; however, only 71 % of access water is considered safely managed (World Bank, 2018).

In this regard, environmentalists, institutions and even individuals from different sectors of society are to be more concerned and strive very hard in making sure that a paradigmatic shift concerning environmental sustainability is maintained in developing countries, particularly Nigeria. Accordingly, this work focused on environmental management practices, with the view of providing a pointer for a shift concerning environmental sustainability in Nigeria. This in essence, might perhaps develop a comprehensive and integral environmental consciousness and possibly strengthen our stance as unified force to preserve, protect and conserve our natural resources (environment). The importance of proper environment management as a prerequisite for sustainable development was recognized by Carlos *et al.*, (2017) at the highest decision making levels. As such, establishing Environmental Impact Assessment (EIA) process and curbing environmentally damaging actions, to reduce environmental degradation for ensuring environmental resources sustainability is to be considered significant (Shehu & Jimme, 2016).

Managing waste in a society can become a challenge for as long as people have gathered together in sufficient numbers. The management of waste in Developed Countries might be viewed to operate at high level of standards, whereas, in Developing Countries, Solid Waste Management [SWM] might be a menace, possibly because of ineffective management. For example, Guerrero, Maas & Hogland (2013) observed the inadequacy of the existing public facilities (including sanitary facilities) to serve the growing population in Accra, Ghana, and pointed out that the sheer volume of Municipal Solid Waste [MSW] generated in the countries urban centres is becoming overwhelming. In Developing Countries, problems can be encountered at all levels of management namely; collection, transportation and disposal of waste (Sam, 2009). The author further stated that in several cases, waste collection vehicles, compactors and other heavy equipment required for effective waste evacuation can be very few. There might be no waste separations at the sources of generation. In some cases, hazardous and clinical wastes might often be handled together with MSW.

On the other hand, the word “sustain” (sustainere) comes from Latin, (sus-meaning from below and tenere, meaning to hold or maintain). It therefore means, long term support or performance. When applied to development, sustainable development implies development that meets the need of the present without compromising the ability of future generations to meet their needs. It is all about safeguarding long term ecological sustainability, satisfying basic needs and promoting intra-generational and inter-generational equity (Holden *et al.*, 2014). Certain global environmental problems that arose in the late 20th century highlighted the unprecedented extent of human impacts on the environment. These problems include climate change, ozone layer depletion and loss of biodiversity. Biodiversity refers to the sum total of all plants, animals, fungi and microorganisms in the world or in a particular area, including their variations and interaction. It can again be referred to as the diversity/variety or genetic species, or ecosystem variation within an area, biome or planet (California Biodiversity Council, 2008; National Wildlife Federation & UNEP, 2013). These impacts led

to the issue of sustainability, which involves three main interactive realms: environment, economic and social equity which are considered to be useful in comparing the concepts of ecological, social and economic sustainability (Ernest, *et al.*, 2009; People's Sustainability Treaty, 2013).

### **Impacts of Poor Environmental Management on Sustainability**

Despite increased efforts by various successive governments at improving public health and quality of life, Federal Ministry of Environment (FME) (2005) observed that basic health indicators in Nigeria have remained poor since sanitation related diseases still play a large role in creating ill health and poverty in our country. Similar situations obtained in several African countries. For example, Ghana recorded 3,286 cholera cases and 54 related fatalities, between December 2010 and March 2011. On another hand, Harare city in Zimbabwe had recorded 9,785 cases of cholera and 330 fatalities. At the national level, Zimbabwe recorded 29,522 cholera cases and about 1560 fatalities (WHO, 2004). These situations in Nigeria and cases in many African countries were clearly linked to poor implementation of waste management policies.

As a result of this situation, the bulk of municipal running costs for many cities will go towards waste management. On the contrary, it is expected that where proper environmental management policy implementation is observed, the impact of policy implementation in environmentally sustainable cities is such that they are likely to be more productive, competitive, innovative and prosperous. Whereas waste management and recycling could create millions of jobs through small and medium sized enterprises, yet waste recycling and minimization is absent in policies of most African cities and as a result many of the derivable benefits could not be accessed (Schubeler, 1996). While in western countries waste recycling at source is receiving growing recognition for its contribution to sustainable development, this is yet to emerge in Africa and that local authorities reportedly show little interest in alternative waste management methods, hence the realization of only 1.5% of formally recycled wastes in Africa (Gehan, *et al.*, 2009; Oteng-Ababio *et al.*, 2013; USEPA, 2014).

Impact of policy implementation can be traced in China's Supply and Marketing Cooperative (SMC) which is an economic cooperative organization in charge of merchandise trade in the planned economy era. As early as the 1950s and 1960s, China established recyclable resources systems in urban and rural areas around the country. The wastes of large, medium and small enterprises were recycled directly and regularly. Collected and recycled waste included ferrous metals, nonferrous metals, rubber, plastics, paper, rags, linen, cotton and chemical fibre waste, glass, bottles, machinery and electrical hardware, chemical waste, waste oils, etc. (Hongpin *et al.*, 2009). With reformation and the opening-up of China, the former planned economy shifted towards a market economy, with many individuals and private enterprises participating independently in the recycling sector.

In order to ensure sustainable development principles and best management practices, Municipal Solid Waste Management (MSWM) is an area where improvements are needed. In this context, Portugal for instance, implemented a strategy in 2003 under the title "New Public Management", the main objective and impact of which is to create value for citizens, with a particular focus on improving performance in the public management of wastes. Overall management performance of 52.45%, which was considered a good result since it was the first implementation approach (Mendes *et al.*, 2012). Out of the four Balanced Scorecard (BSC) perspectives, the learning and growth perspective (15% weighting of

overall management performance) and the financial perspective (10% weighting) had the smaller achievement performances, of just 4% and 1.75% of the indicators achieved, respectively. The internal process perspective (50% weighting) and the client perspective (25% weighting) had higher achievement performances at 34.2% and 12.5%, respectively (Mendes *et al.*, 2012).

With regard to impact of environmental management policy implementation, the overall management performance in the Portuguese Public Administration service was considered, where, Balanced Scorecard according to Mendes *et al.*, (2012) when applied to urban hygiene and solid waste division of the Loulé municipality in the south of Portugal is able to contribute to the precepts of modern public waste management, Focus on the strategic management of the client-customer relationship, Guarantee the best combination of improvement in service, Through monitoring and a follow-up process and achieve management objectives.

### **Environmental Challenges on Sustainable Development**

One of the environmental challenges on sustainable development pointed out by International Labour Organization (ILO) (2008) is the climate change. With climate change, global temperatures have risen by 0.74°C over the last century (the largest and fastest warming in the history of the Earth detected by scientists). The trend is accelerating and has affected all continents and most oceans. Although, developing countries like Nigeria have historically contributed least to emissions causing climate change, they stand to suffer most because many are vulnerable and least able to adapt to extreme environmental events. Most impacts in the short to medium term will come from increased variability of weather and more frequent and extreme events like storm, drought, floods and heat waves. These events will equally lead to serious disruption of economic and social activity in many sectors of the country- Nigeria.

National Oceanic and Atmospheric Administration (NOAA) (2013) pointed out that, in the absence of policies to mitigate climate change, Green House Gases (GHG) emissions could raise significantly over the 21st century. Additionally, in order to avoid dangerous, possibly irreversible and self-reinforcing climate change, scientists suggested that atmospheric concentration of GHG should not exceed the equivalent of 450 parts per million (ppm) CO<sub>2</sub>. New technologies will be needed (particularly in the least developed countries) including Carbon capture and storage, together with additional development assistance. In line with the principle of common but differentiated responsibilities, support for urgent collective action to mitigate and adapt to climate change is to be provided to developing countries (Anup, 2012; NOAA, 2013). In this regard, United Nations (UN) Conference on Environment and Development emphasizes that in sustainable development everyone is a user and provider of information (Anup, 2012).

Furthermore, environmental challenge on sustainable development will be viewed from the angle of environmental resources. A full examination of the implications of current environmental resource constraints may be a harbinger of increased pressure on global natural resources and thus the need to shift to an economic model that values resource productivity much more highly. For developing countries, such as Nigeria, a vital issue of economic, social and environmental sustainability is the promotion of sound environmental management targeted toward attaining environmental sustainability.

### Environmental Considerations about Solid Waste Management Practices

The choice of effective methods for solid waste processing can best be decided only after the study of hazardous impacts of solid waste on human life. The solid waste disposal practices are the major problem in developing countries such as Nigeria which can be classified according to:

- A. The principle sources of solid waste: This include such sources as municipal waste, industrial and commercial waste, building and demolition waste, municipal solid waste (waste collected from town/city such as refuse and garbage - highly decomposable food waste and rubbish - non easily degradable waste like rubber, glass, metal).
- B. Hazardous nature of solid waste: The solid waste produces various hazardous substances which may result to serious health and environment hazards. Some of the major effects here can include disease spread, mosquito breeding and development of other vector species, emission of offensive odour, leachate formation, gas formation, soil infertility and destruction of local ecosystem.
- C. Methods of disposal: There are various conventional methods of solid waste disposal including i) the hierarchy of method; which is based on environmental principles and implies that waste, depending on its characteristics, should be handled by different methods, ii) trash; bulky waste material which requires special handling, like electronic in a flexible way and it is only meant as a guideline to achieve the best environmental solution in long term, and iii) dumping of solid waste; a very effective method for solid waste disposal. Although it is at last in the hierarchy, it is widely used all over the world.
- D. Conventional process of dumping: The dumping of solid waste can be made effective by implementing it in the proper scientific and engineering manner including;
  - i. Collection of solid waste: The collection of solid waste is generally done at the various levels. The waste produced in housings is collected at those local points from where the entire mass of waste is collected. This is aided by various facilities/instruments for proper management.
  - ii. Transportation: The collected waste is transported to the disposal site. Care is needed to be taken while transporting waste in order to avoid any mishap associated to waste transportation. Vehicles mainly utilised for solid waste transportation include collection trucks, front loader, rear loader and side loader.
  - iii. Dumping: The actual process of dumping initiates the selection of dumping site. Usually, the dumping site is so selected that it should be away from human habitat. Wastelands, barren farms and stone quarries which are not in use are considered suitable sites for dumping of waste. Before dumping, the waste is to be processed by reducing its hazards, energy can be recovered from the waste and part of wastes can be recycled.
- E. Geo-environment: As the solid waste is practically dumped in the soil, it hazardous impact is directly felt by the Geo-Environment, the impact of which is ultimately reflected on environmental resources (Dwivedi, *et al.*, 2014). Basically components of geo- environment comprise all the natural resources on which the major effect of dumping solid waste is to be observed soil, ground water, surface water bodies and atmosphere. The authors further highlighted the inter-relationship between the environmental components in this regard in such a way that, i) soil is media in which solid waste is dumped practically, ii) soil is media for ground water flow, iii) mixture of dumped waste traces with ground water, iv) groundwater got mixed with surface water body further contaminating it, v) dumping of solid waste encourages the

decomposition of organic waste which leads to formation of gases like Methane which evolves in to the atmosphere, the large quantity of which result global warming, vi) effects on the surrounding ecosystem on which solid waste were dumped as well as the path along which these waste traces flow, vii) during rainy season, the surface runoff over the dump site may lead to the flow of waste traces in to the low lying water bodies, pollutes the soil through percolation.

Impacts of dumping solid waste on Geo-environment, pointed out are to be seen in:

1. Leachate Containment: Solid waste dumping generates highly contaminated liquid called as Leachate. Past practices in dumping site relied on the natural ability of soil to filter and absorb the pollutants. Some leachate results directly from the moisture and decomposition of garbage and other putrescible material in the waste material, but much of it may come from runoff or surface water that first infiltrates the field and percolates downwards through the waste dumped. If leachate then reaches and mixes with ground water and seeps out of the field into a nearby stream or lake, significant environmental damage can occur. Generally as more water infiltrates and flows through the landfill, more pollutants are leached. The design of landfill leachate treatment and landfill closure requirement is one of the major engineering challenges for environmental compliance. (Serdarevic, 2018).
2. Gas Formation: About 50% of the municipal solid waste in the landfill site might be broken down by bacteria for energy. This is done by aerobic or anaerobic fermentation. The degradable organic matter gets broken down into a stabilized organic residue (or compost), and water and carbon dioxide, the latter contributing to the composition of landfill gas. The waste quickly becoming anoxic due to the high oxygen demand for bacterial respiration in sanitary landfills. Anaerobic fermentation of organic matter will take place if sufficient moisture is present. Moreover, microorganisms, including methanogens, become established. Organic acids and hydrogen in the waste are then metabolized forming methane and carbon dioxide. If the methane migrates to areas of the landfill, which are operating under aerobic conditions, it may be oxidized to CO<sub>2</sub> by methanotrophic bacteria (Dwivedi, *et al.*, 2014).
- F. Change in characteristics of soil: Dumping of solid waste leads to change in the following soil properties; odour, water content, permeability, bearing capacity, porosity, degree of saturation, alkalinity, and power of hydrogen (PH). These changes adversely affect agricultural, through reduction in soil fertility, habitat loss of soil micro-organisms, destructs the habitat of some beneficial micro-organisms like bacteria due to change in chemical environment. The growth of plants on dumping site or nearby dumping site is of only restricted type. Only few species of plants are observed on such sites, which are susceptible to the dumped waste. No other plant species can survive, the same effect can be observed in birds, animals and ground worms also. In the long run, bioaccumulation; the concentration of hazardous substances in the waste, through the available plants, continues in the food chain and food web processes (Dwivedi, *et al.*, 2014).

### Conclusion

Implications of current environmental management is deduced to be a harbinger of increased pressure on global natural resources and thus the need to shift to an economic model that values resource productivity much more highly. For developing countries, such as Nigeria, a vital issue of economic, social and environmental sustainability will be the promotion of proper environmental management practices for the realization of environmental sustainability. The subject discussed, clears the impact of solid waste dumping on Geo-Environment. The effects are easily seen because of solid waste. But there are many more invisible effects of improper solid waste dumping on life. Instead of only economic point of view, the environmental conservation should be given the priority for such activities. As the problem is directly related with man's health.

### Recommendations

A number of recommendations are hereby offered for a paradigmatic shift concerning environmental sustainability in Nigeria.

- I. Sustainability is directly linked to the quest for sustainable development. This is a development that does not jeopardise future generations and recognises the nested interdependency between the economy, society and the environment. Paradigmatic Shift as regards environmental management practices for sustainability in Nigeria, vehemently requires every person to promote the purposes of maintain basic ecological processes of land, water and air, ensure the environmentally sound and healthy quality of the present and future peoples' lives, as well as, promoting the sustainable use of renewable natural resources and the rational use of non-renewable natural resources.
- II. The use of some geo-synthetic materials and treatment of waste before dumping, are some ways to neutralize the long term effects of waste. The rules made for such activities should be implemented strictly. Also, new methods of dumping and treating waste such as reduce, reuse and recycle and engineered landfill, incineration, pulverization and composting are to be implemented. Such steps towards the dumping site developments will definitely lead the welfare of human beings by means of environmental conservation, thence sustainability.
- III. Sustainable development policies should incline us toward longer term, broad - spectrum interventions, touching upon the driving forces operating in human society. In many developing countries, this would mean tackling inequities, poverty, and population growth and thereby contributing, for example, to the control of land degradation and deforestation, biodiversity loss, soil erosion, food insecurity, and decline in water quality.
- IV. In addition, emphasis should be placed on reducing unsustainable consumption, curbing the use of non-renewable fuels, and reducing generation of solid wastes to minimize trans-boundary pollution, toxic waste problems, and global environmental change. Also, health and environment concerns must become an integral part of the planning within the framework of sustainable development.

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