

**SOLID WASTE RECYCLING IN ANAMBRA STATE: NEGOTIATIONS FOR MEDIA
ENLIGHTENMENT**

EKWUGHA, UCHENNA PATRICIA (PhD)
Lecturer, Department of Mass Communication
Nnamdi Azikiwe University,
Awka, Anambra State, Nigeria
Phone: 234(0)8035962584,
E-mail: ucheekwugha@yahoo.com;

NWAMMUO, NKIRU ANGELA (PhD)
Lecturer, Department of Mass Communication
Chukwuemeka Odumegwu Ojukwu University,
Igbariam, Anambra State, Nigeria
Phone: 234(0)8036769099,
E-mail: angelanwammuo@yahoo.com;

&

OKAFOR, EKENE GODFREY
Lecturer, Department of Mass Communication
Nnamdi Azikiwe University,
Awka, Anambra State, Nigeria
Phone: 234(0)8068683384, E-mail: ekeneokar@gmail.com;

ABSTRACT

The indiscriminate disposal of solid waste had begun to constitute environmental nuisance and pollution in Nigeria as they exhaust the dumpsites, clog drainage channels, encourage breeding of mosquitoes and worsens the spread of diseases. The Cradle to cradle theory, as applied to this work suggests that certain products could be reused endlessly to make similar products (cradle to cradle), rather than recycled into lower-grade products until the last stop is a landfill (cradle to grave). However, the work is premised on the significance of waste recycling as well as the need for positive reaction and public enlightenment on the idea. This work is also a convergence of various academic literature on the concept of recycling; the concept of solid waste management; the concept of waste; the concept of waste management, the concept and importance of recycling. The work further looked at the process of waste collection and the need for solid waste recycling in Anambra State and further explored the existing studies on these areas. The work therefore recommends that the government should adopt the idea of recycling of these wastes as part of measures of ensuring effective waste management because recycling will help turn them into valuable resources.

Keywords: Waste: recycling; waste management; waste collection; Public Enlightenment;

INTRODUCTION

SETTING THE SCENE

It is obvious these days that plastic wastes, especially low density poly-ethylene (LDPE) pose a great challenge on the effort of achieving clean and safe environment especially in developing countries and rural communities. They can pollute the environment, exhaust the dumpsites, clog drainage channels, add to flood menace and can further pose great challenge to the society in form of littering of streets, air and water pollution as well as other health related diseases. To ensure proper management of these wastes for improved economic standard, recycling of the wastes becomes inevitable, apart from the routine collection, transportation, treatment and disposal of these solid wastes. This is because recycling makes use of materials that otherwise would become waste by turning them into valuable resources and helps reduce green house gas emission, in part, by diverting waste to useful resources.

However, LDPE wastes reduce the aesthetic beauty of the environment, encourage breeding of mosquitoes, constitute environmental nuisance and could cause road spoilage because of their tendency to clog drainage channels, resulting in stagnation of runoff water on the road whenever it rains in turns creating pot holes (Onwuka and Ajator, 2018). Different types and qualities of polythene keep evolving as technology for improving them keep also evolving day by day; therefore, enormous volumes of plastics composed of bags, dishes, packing materials, etc., after daily use, generate large volume of non-degradable wastes.

However, these wastes which litter and damage the environment could be converted to wealth via recycling. This makes studies of this sort essential. Therefore, effective management of solid waste in Anambra State in particular and in Nigeria at large, is an important environmental need which involves the collection, transportation, storage, treatment, monitoring, recycling resources, and disposal of solid waste. Since each type has its own chemical makeup, different plastic wastes cannot be recycled together, thus separation of different plastic wastes before recycling is necessary unlike organic wastes (Onwuka and Ajator, 2018). It is also paramount that, the recyclables particularly plastic wastes be judiciously separated and sorted according to their types and aggregated together, for reuse by production companies.

STUDY BACKGROUND

While Waste Management is a globally challenging issue especially in developing countries, due to its adverse environmental effects (Schiopu, Apostol, Hodoreanu, and Gavrilescu, 2007), in Nigeria, waste management sector is still underdeveloped due to lack of adequate funding, ineffective waste management practices and recycling (Agunwamba, 1998). While efficient and appropriate collection and disposal of solid waste has been recognized as essential to the hygiene and health of urban societies, sanitary engineers and the broader public has also come to understand that inappropriate treatment of waste could cause major environmental degradation and that recycling could contribute significantly to environmental sustainability (Ndubuisi-Okolo, Anekwe & Attah, 2016). Indeed, waste management is quite a serious issue due to its human health and environmental sustainability implications. It is also a critical issue confronting practically every State in Nigeria because of its human and environmental sustainability implications. As humans depend on the environment to sustain their lives, proactive measures have to be taken into cognizance towards managing waste in order to achieve economic, social and environmental protection which form the basic components of sustainability development (Ndubuisi-Okolo, Anekwe & Attah, 2016).

It has been observed the commonly practiced waste management option in Nigeria, basically involves the collection of mixed waste materials and subsequent dumping at designated dumpsites. It is not a practice to separate waste materials at source or any point during its management (Adekunle et al, 2011), hence the need for effective waste recycling, which is regarded as a development initiative aimed at enhancing quality of the lives of citizens in a country by turning solid waste to wealth. This is part of Waste management procedures which is imperative and development oriented.

However, literary evidence also shows that improperly stored refuse can cause health, safety and economic problems; all living organisms create waste, but humans create far more waste than other species and to prevent damaging the Earth's ecosystems and maintain a high quality of life for the planet's inhabitants, humans must manage and store their waste efficiently and safely (Ndubuisi-Okolo, Anekwe & Attah, 2016). In view of these, Anambra State Government through the state Waste Management Agency (ASWAMA) and the Ministry of Local Government in the state had swung into action to inspect and ensure proper management and disposal of waste in Anambra state because improper waste handling and management pose serious threats to the environment and public health.

Meanwhile, three components of sustainable development include: economic development, social development and environmental protection and there are as well, many factors that contribute to the degradation of environmental quality especially household and industrial waste (Ndubuisi-Okolo, Anekwe & Attah, 2016). The idea of waste recycling resonates with the sustainable development initiative whereby solid waste is channeled into the production of various other products. Therefore, if there is to be sustainable development in waste management in Nigeria, there is need of converting the waste to wealth for the production of relevant products for use in the society. This paper therefore argues that although improperly stored waste can cause health, safety and economic problems which are detrimental to human existence, recycling of the waste for the production of essential products will further improve the living standard of the people and economic condition of the Nigerian society.

Historically, Solid waste management is one of the major services provided solely by the government for several years in Nigeria; It is on record that since the 1976 Local Government Reforms, the collection and disposal of solid waste have been the statutory responsibilities of local government authorities in Nigeria (Amobi And Agu, 2017). Despite the synergy of efforts between both Anambra state government and local authorities, solid waste management, especially, the organic portion of the waste has continued to be a major environmental problem in Nigeria indicating that an effective and efficient waste management plan is not yet in place. The state government rebranded the waste management agency from Anambra State Environmental Protection Agency (ANSEPA) to Anambra State Waste Management Agency (ASWAMA) yet the challenges of properly managing solid wastes (the issues of ineffective collection, transportation, monitoring (enforcement of sanitation laws), recycling, treatment and disposal of solid wastes) in Anambra State still persist (Amobi And Agu, 2017). The level of public awareness and attitudes to solid waste in Anambra State is gradually improving due to state government commitment in waste management but one can still find heaps of wastes dumped indiscriminately; roads and streets littered with garbage; drainages completely blocked by solid wastes; and unofficial refuse dumps created by anyone who cares to create one anywhere. It has also become culture in some parts of the State for waste receptacles to be filled to the brim and wastes littered on the roads before the waste management agency will evacuate them and most times, it takes three to four days for waste receptacles to be returned (Amobi And Agu, 2017). These poor sanitary practices in some parts of the State are appalling and constitute serious health challenges to the inhabitants of Anambra State.

SOLID WASTE MANAGEMENT

Solid waste management is a polite term for garbage management and as long as humans are living in communities, solid waste will continue to be an issue (Amobi And Agu, 2017). Waste management encompasses the whole process of generating, keeping; treatment; handling and disposal of wastes in such a way as render it harmless to humans, animals, ecology and the environment and this calls for timely and effective management of waste which highlights one of the most critical challenges of sustainable development which demands meeting the needs of the present without compromising the ability of future generations to meet their own needs (Ndubuisi-Okolo, Anekwe & Attah, 2016). Modern societies generate far more solid waste than early humans ever did. Daily life in industrialized nations can generate several pounds (kilogrammes) of solid waste while agricultural wastes, commercial and household wastes are

generated in large quantum prompting for effective ways of managing than in order to avoid environmental pollution. Solid wastes are all discarded, putrescible and non-putrescible solid and semi-solid wastes, including garbage, trash, refuse, paper, rubbish, ashes, construction and demolition wastes, discarded home and industrial appliances, manure, vegetable or semi-solid wastes and others substances or material resulting from various community activities (Amobi And Agu, 2017). Solid waste consists, therefore of discarded materials resulting from domestic and community activities and from industrial, commercial and agricultural operation (Okpechi, 2007 and Ezigbo, 2012).

The needs for proper solid waste management, according to Eberinwa (2010) are; to preserve the aesthetic beauty of the environment and ensure favourable living and working conditions for man; to avoid pollution by not directly or indirectly altering the physical biological and thermal properties of any part of the environment by allowing such refuse to accumulate in excessive or dangerous amount or to create a condition which is hazardous to public health and safety or welfare to animals and plants; and to try to reduce the incidence of epidemics of available diseases, which often results from failure or delay in disposing wastes. The primary objective of solid waste management should revolve around the use of resources efficiently in the process of waste materials.

The components of solid waste management identified by Iloanya (2011) include; solid waste generation; solid waste evacuation and solid waste disposal. It is critical to adopt a broad approach in developing a working framework for solid waste management. This covers the social, economic, technological, political and administrative dimensions. For example, the social dimension of solid waste management involves waste minimization; the economic dimension of solid waste management involves waste recycling; the technological dimension involves waste disposal; and the political and administrative and disposal (Amobi And Agu, 2017). The waste management hierarchy (minimization recovery and transformation and disposal) has been adopted by most industrialized nations as the menu for developing solid waste management strategies. The extent to which any one option is used within a given country however varies, depending on a number of factors, such as topography, population density and transportation infrastructure, socioeconomic and environmental regulations (Eberinwa, 2010).

There are a range of actors in solid waste management and they are be clustered into to four groups, which are the public sector (national authorities, local public departments) constituting a central set of players; the private sector (large and small registered enterprises carrying out collection; transport, disposal and recycling); the small scale non-recognized private sector (waste pickers, itinerant buyers, traders in waste materials and non-registered small scale enterprise); local community and its representatives (NGOs and CBOs). In solid waste management systems, the stakeholders involves are varied and numerous. The federal, State and Local Governments are all involved in waste management in Nigeria. The federal government oversees the state and local agencies and authorities that manage waste in the country. A wide range of individuals, groups and organizations are involved as services users, service providers, intermediaries and regulators.

Communities and non-governmental organizations (NGOs) are also partners in solid waste management. NGOs operate between the private and government realms. They are motivated primarily by humanitarian and/or developmental concerns (Amobi And Agu, 2017). They help to increase the capacity of people or community groups to play an active role in local solid waste management. The notable techniques for solid waste management include refuse composting, incineration, sanitary, landfill/dumpsites and anaerobic digestion (Chukwujindu, 2010 and Momodu, Dimuna and Dimuna, 2011). Solid waste management in developing countries is predicted to face a great challenge in the future owing to their rapid urbanization and economic growth.

Irrespective of the fact that most of the developing countries are still in the early stage of their urbanization and economic development, it is expected that the challenges of solid waste generation and management could be avoidable in such countries through recycling of wastes considering that most cities in developing countries spend significant portions of their municipal revenue on waste management. The current practice of collecting, processing and disposing municipal solid wastes is also considered to be least efficient in the developing countries. This is often occasioned by low collection coverage, irregular collection services, crude open dumping, burning without air, inefficient water pollution control, the breeding of flies and vermin, and the mishandling and uncontrolled informal waste picking or scavenging activities, thus disregarding the need to recycle these wastes for production of further commodities aimed at economic growth.

CONCEPTUAL REVIEW **CONCEPTUALIZING ‘WASTE’**

A quick look at definitions of waste in media and printed documents reveal that waste is considered an unwanted good that is no longer useful or desirable. In the German Waste Act of August (1993) waste is defined as “a portable object that has been abandoned by the owner” and also as an “orderly disposal garbage”. The Framework Directive on Waste in the United Kingdom states that waste is a substance and/or object that is discarded by its owners. Egun (2012) defined waste to wealth concept as the transformation of waste from an exhausted utility to a valuable commodity as a mechanism for effective and efficient solid waste management. Waste management technologies such as material recovery facility, composting, anaerobic digestion, gasification, pyrolysis, incineration with energy recovery and even landfill with biogas extraction are employed to bring value to the wastes (wealth) (Onwuka and Ajator, 2018).

Waste can also be defined as those materials which are generated as a result of normal operations over which we have control in terms of their production, disposal or discharge and as any substance or object which the producer or holder discards or intends or is required to discard. Wright (2005), sees waste as the total of all the materials thrown away from homes and commercial establishments and collected by local governments. It encompasses food wastes, household waste, containers and product packaging, dirt, demolition and construction wastes and other kinds of inorganic wastes from residential, commercial and institutional sources, the collection and disposal of which are performed by local authorities and which may be in either solid or semi-solid form. Examples of this kind of waste are electronic appliances, newspapers, clothing, food scrapes, boxes, disposable table wares, office and classroom papers, furniture, wood pallets, rubber tyres and restaurant wastes.

However, Graiser (2007) refers to solid waste as ‘solid material which is discarded and this definition ignores the relevant issue of the usefulness, value, or desirability of the matter in question, but in as much as discarding is an intentional act, it implies that the discarded judges the material to be of relatively little current value to him. Rodgers, (2011) contends that waste management is a systematic control of generation, storage, collection, transportation, separation, processing, recovery and disposal of solid waste. In the smallest of places, solid waste management is accepted as a major aspect of the indigenous community organization and traditional home management; hence every house/compound has a designed area for solid waste collection/disposal and or incineration (Sanda, 2008). In Nigeria, wastes are generated in homes, commercial, industrial sites, hospitals, schools, on streets and even religious activities.

The forgoing suggest that Waste management involves the packaging, collection, transport, storage, treatment, recovery and disposal of waste and also a the body of actions related to waste characterization, classification, selection, storage and transportation, as well as its transfer, treatment and final disposal. It also involves the collection, transportation, processing, managing, and monitoring of waste materials. These materials can be solid, liquid, or gaseous substances.

Waste management according to Adewole (2009) in Ndubuisi-Okolo, Anekwe & Attah (2016) is the collection, keeping, treatment and disposal of wastes in such a way as to render it harmless to human and animal life, the ecology and the environment generally. From the point of view of sustainable development, waste can be interpreted broadly or narrowly. Broadly it might be construed as including various forms of pollution, ranging from discharges of toxins into the commons, or of emissions into the atmosphere. A narrow interpretation on the other hand, can be characterized as those byproducts of production and consumption that are the subject of specific waste control programs. United Nation's (UN) (2008) further defines sustainable development as 'development that meets the needs of the present without compromising the ability of future generations to meet their own need. The principle of sustainable development seeks to achieve societal and environmental equity while in pursuit of economic gain. Sustainable development is an implied development without destruction, it is the judicious use of non-renewable resources for the present and future generations, which are non-renewable resources, which must be used at a judicious rate, neither too fast nor too slow and to ensure that the natural wealth that they represent is converted into long-term wealth as they are used (Adewole, 2009). In Nigeria, we succinctly put it as sustainable development without jeopardizing future development, meaning that in our efforts to explore and exploit the natural resources to serve us, there is an obvious paradox evident in the need to ensure economic development, while protecting the environment. It is important to note that there must be a balance between levels of development and the stock of natural resources, that is, development must be at a level that can be sustained without prejudice to the natural environment or to future generations (Ndubuisi-Okolo, Anekwe & Attah, 2016).

Meanwhile, the environment of man lies at the mercy of both natural disaster and negligence on the part of man in the course of controlling the gifts of nature; the later, takes the form of dumping solid/ industrial waste in an uncompromising, desert encroachment, erosion, depletion of ozone layer, depletion of natural resources, pollution of land, rivers, seas the air and generally the environment (Chukwuemeka, Onwuka, & Obiekezie, 2013). In early times (pre-colonial days up till 1970s, the disposal of refuse and other wastes did not pose any significant problem. The population was small and enough land was available for assimilation of wastes. Solid waste problem started with urban growth resulted partly from national increase in population and more importantly from immigration (Egunjobi, 1986). No towns in Nigeria especially the urban and semi-urban centers of high population density can boast of having found a lasting solution to the problem of filth and huge piles of solid waste, rather the problem continues to assume monstrous dimensions (Mba, 2003; Okpala, 1986.). To urban and city dwellers, public hygiene starts and ends in their immediate surrounding and indeed the city would take care of itself. The situation has so deteriorated that today the problem of solid waste has become one of the nation's most serious environmental problem.

THE CONCEPT OF WASTE MANAGEMENT

Generally, waste management is defined as the collection, keeping, treatment, disposal and recycling of wastes in such a way as to render it harmless to human and animal life, the ecology in particular and the environment in general (Ndubuisi-Okolo, Anekwe & Attah, 2016). The problem of municipal waste has also turned into a global challenge because of an exponentially increased population, rapid urbanization, and worldwide industrialization and limited resources (Narayana 2009; Hazra, & Goel 2009), especially in developing countries facing some typical problems such as poverty and inefficient coverage and operation of services, inadequate or missing recycling strategies and activities, limited or unproductive management of hazardous waste etc, (Henry, Yongsheng, and Jun, 2006; Abdelnaser, & Gavrilescu 2008).

However, while Domestic waste management, collection and disposal have always been a universal issue, waste is one of the three major environmental problems in Nigeria and one of the major environmental problems caused by wastes is pollution characterized by various types of solid wastes constituting nuisance which include paper, textile plastic, metals, glass, bone, wood, vegetal matter and food remnant of multiple consistency. According to studies, there is an accumulation of tens of thousands of tons of organic wastes in Israel (especially in Ramat Hovav), and in the U.S until the 1970's, Federal Agencies had little authority to regulate hazardous and solid disposal in an unsafe manner at landfills or in inclined lagoons, with some

wastes simply dumped on the ground or in surface Waters (Ndubuisi-Okolo, Anekwe & Attah, 2016). Today, solid waste management becomes a complex and multidisciplinary problem, needed to be approached from technical, economic, social points of view in order to ensure its sustainability, since the concept of environmental sustainability is a key criterion to design waste management systems, (Manfredi & Christensen 2009).

There are three components of sustainable development: economic development, social development and environmental protection. Sustainable development ensures a developed world with secured and healthy environment for all; human beings, animals and plants. Since the primary function of solid waste management is to ensure public health protection together with environmental quality and sustainable development, national and local authorities must adopt sustainable solid waste management systems in a tight partnership with both the public and private sector. Since poor waste disposal habit of the people, corruption, weak government regulation, poor work attitude, insufficient fund, inadequate facilities such as plants and equipment among others are factors militating against effective waste management towards sustainable development in Nigeria as a whole. Therefore, if there is to be sustainable development in waste management in Nigeria, the government and the private sector should reconsider the potentials of waste recycling and take positive action towards imbining the right attitude to waste management so as to thoroughly and regularly clean up the environment of all types of waste, taking into consideration both physical and population development of the society.

THE CONCEPT OF RECYCLING

According to Banerjee, (2015), Recycling is a process of changing waste materials into new products to prevent waste of potentially useful materials, reduce the consumption of fresh raw materials, reduce energy usage, reduce air pollution (from incineration) and water pollution by reducing the need for “conventional” waste disposal, and lower greenhouse gas emissions as compared to plastic production. Recycling is a key component of modern waste reduction and is the third component of the “Reduce, Reuse and Recycle” waste hierarchy. Recycling encompasses the reprocessing of waste materials into a usable product or resource for certain materials such as glass, cardboard, paper, steel, aluminium and certain plastics which offers a host of environmental, economic, and social benefits

While the recycling of materials is now a growing industry in many parts of the world, there is need for proper management of solid waste in Nigeria. This is sequel to the preponderance of solid waste in the state. It is also indisputable that achieving a sustainable development requires efficient management of solid waste by adoption of more efficient approach to the reuse of solid waste materials. A degraded environment cannot sustain a continued growth and it impacts negatively on the entire development of a nation. Recycling is therefore the process of separating, collecting and remanufacturing or converting used or waste products into new materials and also involves a series of steps to produce new products. Recycling helps extend the life and usefulness of something that has already served its initial purpose by producing something that is useable. Recycling has a lot of benefits and importance not only to us humans but especially to our planet as different materials require different techniques when recycled such as batteries, biodegradable waste, clothing, electronics, garments, glass, metals, paper, plastics and a lot more.

The recycling process is a cycle and is composed of three stages (Chukwuemeka, Onwuka, & Obiekezie, 2013). The first stage is the collecting and sorting. In this stage, waste materials are collected and then processed and sorted according to its type and use. After these materials are sorted, they are ready for the second stage, which is the manufacturing. The manufacturing stage is the phase where the collected and sorted materials are processed into new reusable products. Finally, after new products are manufactured, the next stage follows which is the selling of the recycled products to consumers. When the product that the consumers bought already served its purpose, the recycling process will then again continue as these products are collected.

Recycling has a lot of benefits that can help people and save the environment as well. Its importance can be observed in many different ways. According to Chukwuemeka, Onwuka, & Obiekezie, (2013), here are some great reasons why recycling is important:

Recycling Saves the Earth:

Recycling different products will help the environment. For example, we know that paper comes from trees and many trees are being cut down just to produce paper. By recycling it, we can help lessen the number of trees that are cut down. Products made from raw materials that came from our natural resources should be recycled so that we can help preserve the environment.

Recycling Saves Energy:

It takes less energy to process recycled materials than to process virgin materials. For example, it takes a lot less energy to recycle paper than to create new paper from trees. The energy from transporting virgin materials from the source is also saved. Saving energy also has its own benefits like decreasing pollution. This creates less stress on own health and our economy.

Recycling Helps Mitigate Global Warming and Reduce Pollution:

By saving energy in industrial production through recycling, the greenhouse gas emissions from factories and industrial plants are lessened and the use of fuels that emit harmful gasses during production is also minimized. Recycling non-biodegradable waste (rather than burning it) will contribute a lot to help reduce air pollution and greenhouse gasses that depletes the ozone layer.

Recycling Reduces Waste Products in Landfills:

Landfills are mostly composed of non-biodegradable waste which takes long time to decompose. By recycling, we can lessen the waste materials that are placed into landfills and we are able to make the most out of these materials. If we don't recycle, more and more garbage will go to landfills until they all get filled up. If that happens, where will the rubbish be placed? How would you like a land fill in you backyard? There are many companies out there that help reduce the problem of overfilling landfills by offering options (like ink cartridges) that make sense. When consumers seek out companies that have established green practices, the consumer wins by not only helping the environment but also by saving money.

Recycling helps you Save Money

Recycling provides ways to save money. You can sell recyclable materials to organizations that are willing to buy it. Using products that are recycled lessens expenses. Products that are made from recycled materials are less expensive than products made from fresh materials. At home, you can recycle biodegradable waste like eggshells, vegetable and fruit peelings and use them to fertilize plants. By doing a little research and getting creative you can save money and trips to the market while being kind to the planet. As the population of the world increases recycling is becoming increasingly more important. Our technologically advanced societies are creating more and products and packaging that look good and are indestructible, but can take centuries to break down. In order to combat the rise of factors that are produced by non-environmentally conscious groups, it is up to the growing numbers of individuals and companies that want to inhabit a healthier planet to make a difference.

According to Chukwuemeka, Onwuka, & Obiekezie (2013), the following descriptions introduce and define the main activities classified under Integrated Solid Waste Management (ISWM):

Recycling: recycling according to them, makes use of materials that otherwise would become waste by turning them into valuable resources. Recycling helps reduce green house gas emission, in part, by diverting waste from land fills, In some countries, a great deal of recycling occurs before the waste reaches the landfill.

Scrap dealers buy directly from households and business, waste pickers or scavengers collect material from waste bin, and waste collectors separate materials that can be sold as they load their truck.

Composting: Another form of recycling according to Chukwuemeka, Onwuka, & Obiekezie (2013), as cited in Uche (2010) is ‘composting’ which is the controlled aerobic biological decomposition of organic matter such as food scraps and plant matter into humus, a soil-like material compost acts as a natural fertilizer by providing nutrients to the soil, increasing beneficial solid organisms and suppressing certain plant diseases thereby reducing the need for chemical fertilizers and pesticides in land scraping and agricultural activities. Organic material often comprises a large portion of the solid waste stream, particularly in communities that rely heavily on tourism. Composting can be particularly, helpful to communities managing their waste and thus reducing their waste and thus reducing greenhouse gas emissions.

Combustion: Combustion is the controlled burnings of waste in a designated facility to reduce its volume and in some cases, to generate electricity. While the combustion process can generate toxic air emission, installing control equipment such as acid gas scrubbers and fabric filters in combustors. Combustion of solid can help reduce amount of waste going to landfills. They also can reduce reliance on coal, one of the fossil fuels that produces green houses goes when burned.

Waste prevention: Waste prevention often called source reduction means reducing waste by not producing it. Example of waste prevention would include purchasing durable, long lasting goods and seeking products and packaging that are as free of toxic substances as possible. It can be as simple as switching from disposal to reusable products, or as complex as redesigning from a product to use fewer raw materials or last longer.

THEORETICAL FRAMEWORK

This work is anchored on Cradle to cradle theory which according to Ndubuisi-Okolo, Anekwe & Attah, (2016) was developed by William McDonough (2002), designed to stop the cycle of use-waste-pollute, which suggests that certain products could be reused endlessly to make similar products (cradle to cradle), rather than recycled into lower-grade products until the last stop is a landfill (cradle to grave). This means that products can be used, recycled, and used again without losing any material quality-in cradle to cradle cycles. Therefore, it could be the good way for reducing the waste from the raw materials of the products instead of using more and more virgin materials. Besides, considering from the waste hierarchy, it also increases the proportion of the waste reuse (Ndubuisi-Okolo, Anekwe & Attah, 2016).

WASTE COLLECTION, RECYCLING, PUBLIC ENLIGHTENMENT AND SUMMARY

WASTE COLLECTION

Waste collection is a part of the process of waste management involving the transfer of solid waste from the point of use and disposal to the point of treatment or landfill. It includes the curbside collection of recyclable materials that technically are not waste, (World Bank, 2012). As pointed out by Ewuim (2012) house-to-house system and neighborhood/communal depots system are the two major solid waste collection systems in many urban centres in Nigeria. According to her, house-to-house system is a waste collection system whereby each household collects its refuse and waste in a refuse bin or in a cellophane bag; and subsequently disposes it through the private refuse collectors or through the government agency that has the responsibility for collecting refuse. However, the greatest problem militating against this system is that, the agency charged with the duties of moving around the cities is often times inefficient; making household refuse to be scattered around the cities by some impatient residents (Amobi And Agu, 2017). In the neighborhood/communal depots system, the government and its environmental agency encourage the residents of the urban centres to carry their waste and refuse to a designated community refuse dump and these types of refuse collection points are located in some strategic areas for easy access but the problem of this system is that, most of these temporary dumping sites becomes breeding areas for rodents and flies, and consequently, constitute

embarrassing sights for residents and passersby, especially when the refuse are not evacuated on time by the environmental agencies (Amobi And Agu, 2017).

Eberinwa (2010) sees solid waste disposal as the final stage of waste management. It is the dumping of solid waste on designated sites and Different methods of waste disposal systems are being practiced throughout the world (Amobi And Agu, 2017). The disposal systems can be categorized into on-site and out-site disposal technique. On-site disposal system involves the use of home grinder, compactors and incinerators which operate like those of out-site disposal system. They are only suitable for a small number of households and are generally more susceptible to pollution because of the use of unskilled manpower. The highly notable waste disposal system includes hog feeding, open dumping, sanitary landfill, composting and pyrolysis (Uchegbu in Eberinwa, 2010).

According to Egunjobi in Agwu (2012), the problem of effective solid waste management has to do with poor social services delivery efforts which cause unnecessary delays in solid waste clearance. It is either broken down machinery, non-maintenance of dumpsters, poorly maintained urban streets and roads and irregularities in the designation of sanitary landfill sites. According to the World Bank (2001), waste generation is greatly influenced by a country's development. Generally, the more economically prosperous a country is, the more waste it generates per capita but the factor that seem to bridge the gap between waste generation and it's resultant effect is the method or efficiency of waste management strategy adopted by such a country. A typical example could be seen when comparing the waste situation in developed countries like; Britain, United States of America, Canada where there exist much economic activities that generate more waste but with a corresponding well organized waste management system compared to the situation in developing countries like; Nigeria, Ghana and Cameroun with their steady increase in population and a corresponding increase in their rate of waste generation from industrial and human activities but without an efficient waste management system. It is realized that the waste situation in developed countries are much better than that of the developing countries irrespective of the volume of waste they generate due to the waste management strategy they practice or employ (Amobi And Agu, 2017).

SOLID WASTE RECYCLING IN ANAMBRA STATE

According to Amobi And Agu (2017), it is wasteful to throw away anything that could be made use of, particularly when there is a desperate need for it elsewhere and Waste recycling is an interesting approach to achieve an efficient, integrated manner of management of municipal solid waste. However, MSW recycling is restricted to well segregated materials This is partly due to the fact that most of the industries do not actively promote take-back recycling as practiced in developed countries such as in Japan (Amobi And Agu, 2017). However, if the raw materials scavenged from wastes are recycled, it is expected that there will be a reduction in the energy associated costs by industries during production. According to Ewuim (2012), solid waste recycling is a scientifically converted to other good uses; through this method waste and refuse are categorized and sorted out before they can be converted to other good uses. However, the method is capital intensive as financial, material (technological) and human resources are needed.

The practice of recycling solid waste is an ancient one where Metal implements were melted down and recast in prehistoric times (Amobi And Agu, 2017). Today, recyclable materials are recovered from municipal refuse by a number of methods, including shredding, magnetic separation of metals, air classification that separates light and heavy fractions, screening, and washing (Amobi And Agu, 2017). Increasingly, municipalities and private refuse-collection organizations are requiring those who generate solid waste to keep bottles, cans, newspapers, cardboard, and other recyclable items separate from other waste (Amobi And Agu, 2017). Special trucks pick up this waste and cart it to transfer stations or directly to recycling facilities, thus lessening the load at incinerators and landfills (Sharma, 2009).

NEED FOR SOLID WASTE RECYCLING IN ANAMBRA STATE

Solid waste recycling in Anambra State is usually carried out by the employees of the waste management agency, private waste contractors and the informal sector (Amobi And Agu, 2017). It is also commonplace to find individual storing unlimited amount of recyclables such as cans, bottles, plastics, newspapers at their residents hoping to sell it to itinerant buyers, or to house-to house collectors of which only few lucky individuals get their recyclable materials sold to these itinerant buyers. As soon as they get frustrated of these piles of waste, they open burnt them at their resident thereby causing air pollution and also open dump some materials like cans, glass, etc.

This recyclables have significant potentials for recovery if there is effective waste recycling (collection) strategy and Such sorting is carried out by the informal sector most dominated by the scavengers with the use of carts for collections, both from street bins and at the dumpsite (Amobi And Agu, 2017). Scavengers normally have no formal education, vocational training or access to appropriate equipment and do not normally have alternative employment opportunities in the formal sector. The scavengers and other informal sector recyclers generally sell their recovered materials to middlemen, who in turn sell to small and large scale processing and manufacturing industries (Amobi And Agu, 2017). For instance, collected glass is processed and recycled locally as cullet for use in the glass industry; whole/complete glass bottles are cleaned and reused as syrup, drinks and juice containers; the base of broken bottles are sold to small scale industries that cut and polish the glass to manufacture items such as ash trays and candle holders.

Recycling option according to Onwughara, Nnorom & Kanno (2010) is the use or reuse of a waste as a substitution for a commercial product or as a feedstock to an industrial process. These include on-site or off-site reclamation of useful fractions of a waste or removal of contamination from a waste to allow its reuse. There are different techniques of recycling;

a. Reuse: This is using item again after their initial consumer use in past either return to original process as re-manufacturing, examples as with copier machines or automobile alternators and as material substitute for another process. Example, reuse of old wood furniture.

b. Reclamation: This is recovery material from waste products so that it can be used again either processed for resource or processed as a by-product. Example, reclaiming glass from old bottles.

This recycling option has been set nationally, unfortunately, the definitions of recycling, rates of recycling and appropriate components of solid waste vary. It has been found to be costly for most municipalities compared to landfill disposal. Recycling is a good option only if environmental impacts and the resources, used to collect, sort and recycle a material to provide equivalent virgin material plus the resources needed to dispose of the post-consumer material safely. Before recycling can occur, the materials must be collected from consumers, a reversal of the logistics system that distributed products to consumers. One of this method of reverse logistics system that is universal, cheap and reliable is curbside pickup system with it peculiar advantages, other method of reverse logistic system include consumer taking recyclable to a central collection point and returning them to the retailer as part of a deposit-refund system (Onwughara, Nnorom & Kanno, 2010).

NEED FOR MEDIA ENLIGHTENMENT

Environmental education is necessary for improving environmental quality (Emeribe, 2000). Much of traditional solid waste management practices such as waste burning, indiscriminate open dumping of waste, ecological ideals and government regulations often arouse conflict. Enlightened debates, public awareness and even outright opposition can promote a forum for dialogue and conflict resolution which can lead to balanced policies which will enhance public commitment. A better understanding of solid waste management and its attendant problems will enhance the effective use of the environment. Although people are capable of influencing their environment in both constructive and destructive ways, yet, much of the

influence has been in the service of making the environment less attractive. People are depleting natural resource and polluting the environment at an alarming rate and it is, therefore, important to educate people better in order for them to have positive attitude, commitment, and motivation to adopt sound techniques in managing their waste products. Environmental education and awareness among decision makers will according to Emeribe (2000) considerably help in a better integration of environmental issues into development planning, budgeting and policy formulations. This will be reflected in the attitude and actions of government functionaries (Aina and Salam, 1992).

Furthermore, the Nigerian populace, both in urban and rural areas, no matter their socio-economic status, need to be sensitized to solid waste management issues and problems. Without proper education, orientation and public awareness at all levels of society; it will be difficult to manage solid waste. Thus, environmental education among the people would generate environmental concerns which could lead to the formation of groups concerned with how to protect the potentials of the environment and avoid or minimize the hazards of environmental pollution and degradation -.for instance, environmental groups in the more advanced countries like the Green Peace, the Friends of the Earth, the Sierra Club, etc, have fought great battles to preserve and protect various species of plants and animals (Agukoronye, 1994), given also that environmental education and public participation in the long run can be cost-saving as expected attitude and commitment to the environment change for better, Hazards of pollution would not only be minimized but the cost of control will also reduce.

Sustainable development is most often defined as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (Emeribe, 2000). Although sustainable development means different things to environmental planners, ecologists, economists and environmental activists, it is important to recognize that, the fulfillment of human needs also depends on environmental factors such as availability of pure water, clean air, adequate living space, and in many circumstances, people’s ability to maintain a spiritual, cultural and aesthetic relation with their environment. This calls for management of the environment as it affects solid waste management. If solid waste disposal is not managed properly it affects underground water, affect the aesthetic condition of our environment and causes health hazards.

The role of people in solid waste management in Anambra State is crucial. The solid waste disposal habit of the people goes a long way to determine the extent to which the environment is clean. The sanitary state of an area is largely influenced by the handling practices of the residents and the measures in place to safe waste evacuation and disposal (Modebe, Onyeonoro, Ezeana, Ogbuagu & Agam, 2009; Onyanta, 2012; Chukwuemeka, Ugwu & Igwebe, 2012, and Uma, Nwaka & Enwere, 2013). Most people have nonchalant attitude towards waste disposal. This kind of person could be perceived as one who litters the environment like no man’s business with no regards or respect to the environment. They do not consider the need to appraise or talk to people and neighbour around them for positive or negative behaviour. They do not consider living in a clean environment as essential. They play passive role in sanitation activities and need to cooperate with others in cleaning up residential surroundings because of their negative attitude. The main reason for the incessant growth of waste volumes in our urban centre is as a result of the ignorance of some dwellers towards the effect of indiscriminate dumping of refuse and carefree attitude of most of the dwellers who know what should be done, but they are careless about it (Afangideh, Joseph & Atu, 2012).

The incidence of poor sanitary practices in Anambra State is a perplexing problem. Solid wastes are generated in large quantity from commercial, agricultural, industrial, institutional and domestic activities, with little or no effort by those generating these solid wastes to properly dispose them. The government and its waste management agency (ASWAMA) have devised several strategies to achieve effective service delivery in solid waste management, yet the poor sanitary practices of the people have negatively hampered the government efforts. Some of the strategies include; providing receptacles in strategic sites to curtail indiscriminate solid waste disposal, encouraging commercial vehicle drivers to have solid waste bins in their vehicles; carrying out sensitization or public awareness programmes on the need to keep Anambra State

clean; and most recently, enforcing the public to dispose their solid waste in nylon bags before final disposal to the receptacles (Amobi And Agu, 2017).

Despite these strategies, the poor sanitary disposition of the public towards waste management still persists. Solid wastes are still disposed indiscriminately; passengers dispose their solid waste on the road while the vehicles are in motion; commercial vehicle drivers hardly have waste bins in their vehicles, even when they have, the passengers unconsciously dispose waste on the roads because it has become the value of the society; and most often, solid wastes are disposed in nylon bags before putting them in the receptacles.

These poor sanitary practices by the residents of Anambra State have led to environmental pollution and degradation capable of posing serious threat to public health. Momodu, Dimuna & Dimuna (2011) and Agwu (2012) revealed that the World Health Organisation (WHO) and United Nations International Children Education Fund (UNICEF) reported that about 2.4 billion people will likely face the risk of needless disease and death by the target of 2015 because of bad sanitation. The report also noted that bad sanitation-decaying or non-existent sewage system and toilets fuels the spread of disease like cholera and basic illness like diarrhoea, which kills a child every 21 seconds. The harvest hit by bad sanitation is rural poor and resident of slum areas in fast-growing cities, mostly in Africa and Asia. This critical report underscores the dangers of poor public sanitary habits and the inevitability of effective implementation environmental protection laws in Anambra State.

REVIEW OF RELATED STUDIES

The California Environmental Protection Agency (2004) had reported that waste diversion of any type, including recycling, was reported to create twice the economic activity per ton of conventional waste disposal and that Recycling also reduces pollution and conserves natural resources, which leads to cleaner air and water, and it increases open space and reduces greenhouse gases.

Matt and Scott, (2005) conducted a survey to examine recycling impact on jobs and the North Carolina economy in their work. This survey followed up a similar effort conducted in 1994 and documents the growth of the recycling industry over the past decade. Some of the findings include:

- Recycling employs approximately 14,000 people across the state.
- In 1994, recycling employed 8,700 people, rising 60 percent in ten years to reach its current level.
- Recycling jobs as a percentage of the state's total employment has increased 40 percent in ten years, from 0.25 percent of the total labor force in 1994 to 0.35 percent in 2004.
- Fifty-four percent of the businesses surveyed forecast creating more recycling-related jobs in the next two years.
- Recycling employs more people than the biotech and agricultural livestock industries in North Carolina.
- The number of companies listed in the state's recycling markets directory has increased from 306 in 1994 to 532 in 2004, a 74 percent increase.

Collins (2008) looked at Environmental Responsibility and Firm Performance, using a field survey methodology, a sample of sixty manufacturing companies in Nigeria was studied. The firms were categorized into two groups, environmentally 'responsible' and 'irresponsible' firms. An investigation was undertaken into the relationship between firm performance and three selected indicators of sustainable business practice: employee health and safety (EHS), waste management (WM), and community development (CD), common within the 30 'responsible' firms. Findings from empirical results reveal that the sustainable practices of the 'responsible' firms are significantly related with firm performance. In addition, sustainable practices are inversely related with fines and penalties. The paper concludes that, within

the Nigerian setting at least, sustainability affects corporate performance and sustainability may be a possible tool for corporate conflict resolution as evidenced in the reduction of fines, penalties and compensations. The paper therefore recommends research into the relationship between sustainability and conflict management.

Modebe & Onyeonoro (2008) examined Household Solid Waste Management in Awka, Anambra State, aimed at ascertaining the waste handling practice among household in Awka, Anambra state. A Descriptive Research Design was employed using cross-sectional data and a total population of 200 households were selected using a multi-staged sampling technique which revealed that the bulk of waste generated was organic waste and nylon bags, that Most of them (85%) stores the waste generated in a closed container outside the house and that about 70% of the respondents dispose their waste through the government waste management agency, while 27% of them dump their waste in unauthorized places

Adewole (2009) while studying Waste management towards sustainable development in Nigeria with emphasis on Lagos State, recommended that expanding recycling programmes can help reduce solid waste pollution but that the key to solving severe solid waste problems lies in reducing the amount of waste generated.

Eunomia, et al (2009) assessed International Review of Waste Management Policy and advocated that in respect of waste management, there are some increasingly strong markers provided in the policy development. Also, the revised directive suggests that policy would do well to take heed of the requirements below:

- Ensure that mechanisms are in places which lead to the separate collection of Glass, metals, paper and plastic (where appropriate), again pre-empting the WFD requirements;
- Implement measures designed to lead to separate collection of bio-waste;
- Implement policies or mechanisms that encourage the use of products of Bio-waste management;
- Ensure that where incineration or co-incineration are employed, permits should not be issued unless the recovery of energy takes place with a high level of energy efficiency Apply the polluter-pays principle; and
- Give substance to the concept of resource efficiency;

With anticipated increases in Nigerian population and associated waste generation, timely and effective waste management remains one of the most critical challenges of sustainable development, which calls for meeting "the needs of the present without compromising the ability of future generations to meet their own needs". The study revealed that, with successful implementation of strategic policy design, Waste generation and its associated impacts can be decoupled from population and urban growth. Good lessons about waste reduction programs can be learned from different Communities. Meanwhile, this study also reveals various challenges facing communities with heterogeneous characteristics, such as housing density, building age, and income.

Accordingly, the work recommended potential opportunities for planners to contribute to community specific waste management programs, the prospect of transforming waste management practice from a cost burden to a long-term economic development strategy, and the need to incorporate waste management into the sustainable urban planning agenda. It is also indisputable that continued growth of urban areas and industrial development contributes to the problem of waste management in recent times. In Nigeria, Environmentally acceptable management of solid waste is also a challenge mainly due to limited resources and inadequate management and without undertaking the appropriate measures to establish effective handling, treatment, and disposal systems, the growing quantities of waste can have various impacts from increased health risks to environmental degradation.

Alakinde (2012) examines private participation in solid waste management in Nigerian cities taking Ibadan South West Local Government Area as a case study which found that majority of the residents in high density zones are using unhygienic means for the storage of their waste compared to what is operating in the medium and low densities zones in the study area. Result of the analysis also shows that the population enjoying private firm participation is comparatively smaller than those disposing their waste in unauthorized places and is mostly found in medium and low density zones. Other problems facing private firms that are managing waste in Ibadan South West are finance, conveyance, charges among others.

In a related study, Beatrice Abila and JussiKantola (2013) assessed Municipal Solid Waste Management Problems in Nigeria. The paper attempts a synthesis of problems relating to municipal waste management in Nigeria and proposes a conceptual knowledge management approach for tackling municipal waste problems in cities across Nigeria. The application of knowledge management approach and strategy is crucial for inculcating a change of attitude towards improving the management of waste. The inefficient management of waste by individuals, households, consumers and waste management companies can be attributed to inadequate information on waste management benefits, lack of producers' involvement in waste management as well as poor implementation of government policies. The paper presents an alternative approach providing solutions promoting efficient municipal waste management. The paper concluded that cultural belief is a major barrier to efficient waste management in Nigeria. Other barriers includes packaging and product manufacturers' involvement and interventions in curbing waste management, ineffective communication, poor personnel morale, absence of centralized waste collection containers, limited collaboration with international organization. It was recommended that the focus of municipal solid waste management should not only be technology centered strategies but also people centered.

Chukwuemeka, Onwuka, & Obiekezie (2013) evaluated the chains of problems militating against solid waste management in Nigeria with particular stress on Enugu State using survey research method and found among other things that resources normally voted by Government year by year to manage solid waste is always very meager and that There is no environmental education at all as was observed during the field investigation. Furthermore, some of the waste management staff were poorly trained and no plan in the future to give them further training or to improve already acquired skill. Based on the findings, they recommended that solid waste management should be provided with a separate head in the budget for the purpose of adequate revenue allocation, implementation and monitoring. The participation of the local communities in solid waste management should be encouraged. Environmental education should be intensified by both the state and local government. Also primary, secondary and tertiary schools curricula should inculcate detailed topics on solid waste management.

Ndumbu (2013) examines the factors affecting success of private sector participation in solid waste management in Mombasa County which found that there was a relationship or correlation between the success of PPPs in solid waste management and the capacity of the garbage collection companies, monitoring and evaluation, transparent and competitive procurement, and public participation. The study established that there was inadequate capacity in the Mombasa City Council to effectively collect and dispose of solid waste hence leaving their responsibility to the private companies which have also been ineffective due to challenges with regards to capacity to effectively meet the demands of the bulging population. The study therefore concluded that engaging private practitioners in garbage collection is the possible solution to the solid waste management challenges facing Mombasa city.

Muhammad and Manu, (2013) researched on gender role in informal solid waste management in Kaduna metropolis of Nigeria using primary data collection method. The study revealed that at household level, women and children play a very dominant role in collection and sell of recyclable materials to Itinerant waste collectors. Distinct gender division of labour was also observed as women are almost conspicuously absent at the higher levels of solid waste recycling processes as a result of cultural constraint, poor coordination

and lack of capital. The study recommended for women integration into the mainstream policy as a poverty reduction strategy.

Yoda, Chirawurah & Adongo (2014) looked at domestic waste disposal practice and perceptions of private sector waste management in urban Accra, using a mixed-method approach of cross-sectional survey questionnaire and in-depth interview. Data were obtained from a total of 364 household heads in the survey and six key informants were interviewed with the in-depth interviews which revealed that 93% of households disposed of food debris as waste and 78% disposed of plastic materials as waste. The study also showed that 61% of the households disposed of their waste at community bins or had waste picked up at their homes by private contractors. The remaining 39% disposed of their waste in gutters, streets, holes and nearby bushes. Of those who paid for the services of private contractors, 62.9% were not satisfied with the services because of their cost and irregular collection. About 83% of the respondents were aware that improper waste management contributes to disease causation; most of the respondents thought that improper waste management could lead to malaria and diarrhoea. The study concluded that proper education of the public, the provision of more communal trash bins, and the collection of waste by private contractors could help prevent exposing the public in municipalities to diseases.

Ndubuisi-Okolo, Anekwe & Attah (2016), investigated waste management and sustainable development in Nigeria with particular reference to Anambra State Waste Management Agency (ASWAMA) using the Survey research design to discover that waste management practice has a significant impact on environmental sustainability in Anambra State. It was recommended that Government should establish stringent legal and regulatory framework that will enhance efficient and appropriate collection and disposal of waste by Anambra State Waste Management Agency, to ensure environmentally sound waste management system that prevents damage to the Earth's ecosystems and maintain a high quality of life for the inhabitants of Anambra State and that there is need for the Government to pump sufficient funds into the agency to enable them dispose waste generated appropriately since hygiene and health of the citizens are very essential.

Onwuka and Ajator (2018) evaluated people's psychology, perception and awareness about plastic waste and the process of pyrolysis otherwise referred to as waste to wealth or reuse, using survey method. They sampled and studied three hostels in Nnamdi Azikiwe University for peoples, perception on the subject matter to be harnessed and they discovered that there is no significant difference on people's psychology towards plastic wastes in the three hostels. There is no significant difference in the perception of people about plastic wastes in the study area and they are not aware that waste can be converted to wealth, thus they handle waste anyhow. The study therefore recommends that there should be public awareness programmes on the role of the masses in efficient waste management, the practicability and gains of waste to wealth projects, among others.

SUMMARY

It is evident that Solid waste management has emerged as one of the greatest challenges facing the State and Local environmental protection agencies in Nigeria. The volume of solid waste being generated continues to increase at a faster rate than the ability of the agencies to improve on the financial and technical resources needed to parallel this growth (Ogweleke, 2009). As a result of this, governments have had a rethink on this issue and have contracted the processes involved in solid waste management to private sector organizations. It is believed that with the participation of private waste contractors, the issue of solid waste collection, transportation, treatment, monitoring, recycling and disposal will be adequately dealt with. Hence the emphasis on accountability, transparency, efficiency, outsourcing, effectiveness and service delivery based on this theory provides the basis for examining the effect of private contractors in solid waste management in Anambra State.

CONCLUSION

There is need for the government and concerned organizations and bodies to address the problem of poor waste recycling and get the government into the action of effective waste management and recycling

RECOMMENDATIONS

i. Government should set up a formal recycling sector where wastes of all kinds will be recycling instead of informal recycling which scavengers adopt who buy unused valuables from people and go to legal and illegal dumpsites in search of materials that can be reused and recycled. The implication is that formal recycling of waste will ensure friendly environment as well as effective waste management practice. However, formal recycling of waste will generate wealth to the state. This will contribute significantly to sustainable development in the state.

ii. The State Government and private waste contractors should establish waste recycling plants which will adequately minimize the tonnes of solid waste dumps at disposal sites. The establishment of these plants will not only achieve solid waste minimization, but will also provide employment opportunities and enhance wealth creation.

iii. Private waste contractors should complement the State Government effort in the area of public enlightenment programmes on healthy sanitary habits. Private waste contractors should also monitor the waste disposal habits of the populace and report violators of sanitation laws to the sanitation enforcement agency.

iv. There is need for public enlightenment and sensitization in line with the submission of Emeribe (2000), that environmental education is necessary for improving environmental quality because much of traditional solid waste management practices such as waste burning, indiscriminate open dumping of waste, ecological ideals and government regulations often arouse conflict. In view of these, there is need for public awareness and commitment.

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