

Waste Recycling as a Key to Conservation of Natural Resources in Nigeria: An Overview

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Waste generation in Nigeria is associated with increase in population resulting from economic development in cities, and this depends on high consumption of raw materials, which is gradually leading to the depletion of natural resources. The management of these wastes and their adverse impacts on the environment was observed to be one of the major challenges being tackled by state and local government environmental protection agencies. This paper focuses on recycling practices in Nigeria, which involves the collection and processing of materials that would otherwise be thrown away as trash, and how these waste materials can be turned into new products, as a fundamental technique in the recovery of natural resources after use. It also reviews the role of waste recycling and its impact on the sustainability of these endangered raw materials. Thus, recycling accomplishes the dual function of the waste utilization and environmental safety, which is a key to natural resource conservation.

Keywords: Conservation; Natural Resource; Recycling; Waste

Introduction

As the World population increases with time, it impels rapid urbanization. In most developing countries, this rate of urbanization in an unplanned manner generates several environmental problems such as public space and riverbank encroachment, erosion and flooding, air and water pollution, and solid waste generation. In developing countries today, waste has become a very important issue, especially in urban areas. Piles of wastes are often found by roads, rivers and many other open spaces in cities, and this is causing significant health and environmental problems [1]. The management of these wastes has been observed to be one of the major challenges being tackled by state and local government environmental protection agencies and they exist in form of masses of disposed heaps of exposed trash and unlawful dumpsites along roads [2]. In the 19th century, rural to urban development was a source of income for rag-pickers, night soil and ash collectors, and other urban gleaners, who could remove unhealthy waste materials and commercialize them by selling them into the growing industrial and agricultural value chains and today, more people have ventured into this activity as it not only generates income but also maintains sanitary conditions by promoting solid waste management and recycling [3].

In developing countries, recycling can be distinguished from solid waste management as it doesn't involve cleaning or removal, but a largely economic activity based on valorization and trading, with strong relationship to the industrial sector for over hundreds of years [4-7]. The concept of recycling has gained much attention

in recent months with the International Development Community (IDF). It involves the collection and processing of materials that would otherwise be thrown away as trash, and turning them into new products. However, Governments of Rwanda, South Africa and Nigeria for instance, are working with the World Economic Forum and the EU, and have recently launched the African Alliance on Circular Economy [8].

Nigeria on the other hand has made little or no effort to adopt or encourage recycling to ensure a maximum conservation of the natural resources used for various development purposes. Raw materials are consumed in large quantities, without a thought on their extinction and possible means of retrieving them after use, so as to save cost of new production. In spite of the several Federal and State Agencies responsible for environmental protection and waste management, there has been extraordinary upsurge in the volume of waste generated by homes, educational institutions, hospitals and markets [2]. Thus, the poor management and utilization of these wastes through recycling has endangered public health by encouraging the spread of odors and diseases, uncontrolled recycling of contaminated goods, and pollution of water sources [9]. De Coverly noted that waste is an aftermath of consumption, thus as consumption rate increases, so too, the production of waste [10]. Wastes from plastics, glass, electronics, metal, paper, tyres, and even contaminated water etc., are often seen as useless and littered all over the place. Natural resources are depleted and product items such as paper, metal, glass, tires and electronics etc., can be recycled, but due to lack of adequate facilities and manpower, these materials are neglected as wastes. Some types of refuse such as the hazardous waste require specialized disposal and may harm recyclables making

them unable to be processed by the repurposing machines, and thus require advanced techniques for effective recycling.

Naturally, the earth recycles everything it produces and reuses them (e.g., decayed animals and plants, to foster the growth of new life, thereby enhancing its own sustainability. This Recycling reduces the amount of waste sent to landfills and incinerators, conserves natural resources such as timber, water and minerals, increases economic security by tapping a domestic source of materials, prevents pollution by reducing the need to collect new raw materials, saves energy, helps create jobs in the recycling and manufacturing industries etc. Thus, there is need to recover these wastes, recycle and reuse them to ensure conservation of resources for generations to come.



Figure 1: Steps to Conservation of Natural Resources through Recycling

Waste Recovery and Recycling Pattern in Nigeria

Nigeria is located in the Western part of Africa on the Gulf of Guinea and has a total area of 923,768Km² and it is the most populous in Africa and second largest economy in Sub-Saharan Africa after South Africa. It shares a 4,047 km border with Benin (773 km), Niger (1497km), Chad (87 km), Cameroon (1690 km), and has a coastline of 853 km at least (The World Fact book, 2011). Geographically, Nigeria lies between latitudes 4° and 14°N, and longitudes 2° and 15°E. Nigeria is a developing country, and according to 2006 Nigerian Census, it has a population of about 140million and a growth rate of 2.38%.



Figure 2: Map of Nigeria showing its 36 states and the Federal Capital Territory (Source: Wikipedia)

In major Nigerian cities like Lagos, Abuja, Uyo, Porthacourt, Aba, Onitsha, Enugu, Kano, Minna, etc., which have recorded massive

increase in population growth and economic development, waste recovery, exchange and recycling activities are concentrated at specific points in urban space. However, the recycling concept in Nigeria is still being explored, therefore, it is essential to add value to waste, making it economically useful [12-14]. All over the country, especially in cities, recyclers can be found mostly at the dumpsites picking valuable materials and most times get hurt in the process if care is not taken. These recovered materials such as bottles and plastics are transported with pick-up vans and sometimes push-carts, from the landfill to bottle and plastic banks, scrap metal dealers, artisan shops and small-scale manufacturers, and then to cities where they are recycled. All aluminum goes to Saki, Oyo state, Nigeria, where they are transformed to cooking pots, plastics are converted to plates, spoons, chairs, and other household items, broken beer bottles end up again as good and clean bottles for industries craving for raw materials, and additionally, a school in Abeokuta collected all worn-out tyres and used them as fence around their playground, and it's very impressive [15]. Nestlé Beverage company has also set the bold global ambition of making 100 per cent of their packaging either recyclable or re-usable by 2025, as part of its pledge to play an active role in combating plastic pollution and conservation of resources. Thus, if these materials are recovered from wastes, recycled and reused, there will be a minimum amount left to be disposed.

Informal Waste Recycling in Nigeria

Major operations of waste recycling in Nigeria are done informally and are currently carried out by informal waste collectors, yet, the environmental agencies have failed to recognize their role [16]. Informal recycling encompasses manual sorting of mixed waste for recyclables at dumpsites, open dumps, street bins and from waste collector carts [17,18]. However, due to the unhygienic method of waste separation and indiscriminate street dumping of unwanted waste, the activities of these informal waste collectors are controversial and seen as illegal. This method of operation not only poses occupational risks for informal waste recyclers but also results in sourcing low-quality recovered materials [19,20].



Figure 3: Sorted Recyclables Packaged for Transportation to Industry [16]

The need to view informal waste recycling as a basis of further development can't be over emphasized, considering its prevalent existence [21]. Therefore, active support and recognition extended to these informal waste collectors or scavengers by government, development agencies, NGOs, etc., would seem to be imperative in order to reap the full benefits of the informal recycling sector in solid waste management in the city [22].

How Does Waste Recycling Conserve Natural Resources?

Despite the increase in awareness, waste management system in many third world cities is seriously challenged. A complete understanding of the composition of a waste stream as well as the activities that determine its generation is essential for effective solid waste management [23]. Adequate attention should be given to conservation of energy and environmental resources in urban design and renewal projects, administrating energy resources, environmental pollution and its impact on human life, as further neglect will severely exacerbate the increasing consumption of fossil fuels, damage to Ozone layer, pollution of land and water resource and the green-house effect [24]. Consistent and excessive use of natural resources, especially for economic development, without a technical means of recovery has posed a threat to their existence and the future generation will have little or nothing to produce from. Recyclable solid wastes include textiles, construction waste, paper, plastic, ferrous and nonferrous metals, and glass and all these have their origin from natural resources. In plastic recycling industries, plastics are shred into pellets to manufacture other plastics and allied products while some other recycling factories process waste paper and cardboard to make tissue paper, newsprint, or bulkpackaging materials [25]. Wastes from glass are processed by glass or terrazzo companies, nonferrous metals are processed by aluminum smelters, and tin is recovered from aerosol cans [26]. Maduabuchi observed that waste water can be treated using bio-adsorbents to absorb toxic heavy metals from effluents, thereby reducing the toxicity or adverse effect of these waste water on our environment or water bodies [27,28]. Countries like Ghana, India, Indonesia, etc., have adopted the use of recycled plastics as partial replacement for bitumen in road construction purposes. Wastes from palm kernel shell (ash) and bunch has been studied and recommended as materials very suitable for stabilization of problematic soils [29,30]. Nigeria can save a lot in waste management cost, construction cost, landfill avoidance cost, etc., through a well-planned recycling program. In order to mitigate the depletion of these natural resources and ensure sustainability, waste recycling is one of the important techniques to be adopted.

Table 1: Recyclables and their uses from solid wastes

Waste	Recyclable Value or Use
Hair, Bristles, Wool, Feather	Brushes, lanol, fertilizer, wigs, blankets, carpets, fabrics, yarns pillows Mattresses
Hoofs, Horns	Buttons, combs, hair pins, novelties, washers, glue, gelatin fertilizer
Bones	Buttons, cutlery, handles, ornaments, glue, gelatin, bone meal
Hides, Skins, Feet	Horse whips, seats, belts, hand bags, book binding, shoes, gloves, Oil, Glue, Gelatin
Intestines	Stockfeed, surgical ligature, musical (guitar) strings, tennis strings, sausages and Putty containers
Blood	Fibrin foam, purified bovine albumin, dried blood and blood meal
Ruminal Contents, Excreta	Methane gas, manure
Fats	Soap, machine oil, candles, leather dressings
Glands and Special Organs	Pharmaceutical products (insulin, gall stones, corticosteroids), Pepsin, Cholesterol, Liver extract, Cartilage

Aluminum	Soft drink and beer cans, cutlery
Paper	Newspaper, packaging materials, crate of egg, tissue paper
Plastics (various types)	Bottles, milk jugs, pipes, thin film packing, battery casings etc.
Glass	Various glass products, decorative pieces, brick aggregates
Ferrous Metal	Tin cans, metal works
Non-ferrous Metal	Aluminum, copper, lead, etc, various items
Yard wastes, Organic Wastes	Compost, biogas
Construction Wastes	Filling materials
Tyres	Road paving, building, shoe soles
Batteries	Recycling for lead, copper, plastics and reuse
Waste Oil Rice Husk	Reuse after refining Briquettes, cement substitute etc.
(Source: [15])	

Hence, waste recycling

- saves raw materials,
- reduces our impact on climate change,
- costs less,
- generates cash,
- creates jobs, and
- sustainable living

Conclusion

Increase in population and economic development has led to depletion of natural resources and increase in generation of wastes. The management of these wastes and conservation of the natural resources becomes a worry in developing countries like Nigeria, due to poor systems of management and knowledge of recycling. However, recycling involves the transformation of materials seen as wastes, to new useable products. Obviously, our traditional economy today enhances economic growth by converting resources to waste, where as the recycling economy is more reliant on recycling these wastes to encourage economic growth, thereby eradicating the contradictions between the environment and urban development, accomplishing the dual function of the waste utilization and environmental safety, which is a key to natural resource conservation. On the other hand, the citizens should be encouraged to;

- Reduce waste by reusing products whenever possible by buying in bulk, and donating items to reuse centers and reusing products whenever possible,
- Purchase products made from recycled material to create a closed circle or loop that ensures the overall success and value of recycling,
- Set aside glass and plastic, aluminum and steel cans, old newspaper, office paper, junk mail and cardboard for recycling, etc.

The role of the informal recycling sector in urban economics, reduction of the amount of wastes requiring disposal, and in the provision of secondary resources for manufacturing, cannot be dismissed as unimportant [16]. However, introducing compulsory recycling is an effective measure for encouraging participation in collection schemes, and has been found to require little or

no enforcement to generate good results. Households should be motivated to adopt recycling measures by relevant authorities and this will definitely go a long way in minimizing the rate of legislation such as Environmental Protection Act and Fixed Penalties or Fines. Thus, by the recovery, recycling and reuse of waste materials, natural resources are not only conserved, but, costs of new production are reduced, jobs are created, energy and water is conserved, there is decrease in air emissions generated in manufacturing processes, landfill space is saved, and pollution is prevented [31-34].

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