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Plastic waste management: A viable strategy for eradicating plastic pollution in Nigeria

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Abstract
Plastic pollution has become a global nuisance that can affect and alter the natural processes, affect the livelihood of millions of people, habitats and natural processes. It also has the ability to reduce ecosystem's ability to adapt to climate change. Plastic pollution is currently impacting negatively on health, environment and the economy of Nigeria. There is therefore, a great need to adapt proper plastic waste management strategies which includes plastic waste recycling to eradicate the menace of plastic pollution in Nigeria. Plastic waste which brings about plastic pollution comes in various sizes, shapes and colors. This study highlights that there are green entrepreneurial opportunities in plastic waste management resulting in wealth creation in Nigeria. This study further identifies and recommends plastic waste management as a viable strategy for eradicating plastic pollution for sustainable development in Nigeria.

Keywords: Climate change, environment, plastic pollution, sustainable development, waste management

Introduction

Plastic pollution can be defined as the accumulation of plastic objects and particles (e.g. plastic bottles, bags and micro beads) in the Earth's environment that adversely affects wildlife, wildlife habitat, and humans (Britannica, 2013) [8]. Plastic pollution can also be defined as the proliferation of the environment with plastic wastes which has harmful effects on man, animals and the environment. Plastic pollution is usually caused by the accumulation of plastic wastes in the environment which constitutes harm to the ecosystem when it is not properly managed (Anabaraonye, Chukwuma & Hope, 2019; Anabaraonye, Okafor & Eriobu, 2019) [2, 26]. Plastic pollution can afflict land, waterways and oceans. It is estimated that 1.1 to 8.8 million tonnes of plastic waste enters the ocean from coastal communities each year (Jambeck *et al*, 2015) [24]. Plastic pollution is indeed capable of affecting land, waterways and oceans as a large percentage of marine and land creatures have died due to the fact that plastic is non-biodegradable and it causes hazards to soil. Living organisms, particularly marine animals, can be harmed either by mechanical effects such as entanglement in plastic objects, problems related to ingestion of plastic waste, or through exposure to chemicals within plastics that interfere with their physiology (Walker *et al*. 1997; Barnes *et al*, 2009) [22, 7]. Solid waste management is the most pressing environmental challenge facing urban and rural areas in Nigeria. Nigeria's population is estimated to double by 2050 and that could mean more solid waste hanging around and more plastic for recycling. "Poorly managed waste is contaminating the world's oceans, clogging drains and causing flooding, transmitting diseases, increasing respiratory problems from burning, harming animals that consume waste unknowingly, and affecting economic development, such as through tourism," said Sameh Wahba, World Bank Director for Urban and Territorial Development, Disaster Risk Management and Resilience (World Bank, 2018) [23]. Plastic recycling involves the recovering and reprocessing of plastic wastes into useful products. In a bid to promote the wellbeing of our environment, it is necessary to develop sustainable means of managing plastic wastes generated from our environment. Therefore, recycling of plastic waste is a necessity in waste management and the entire process has to be cost effective so as to promote sustainability (Olawale, and Damilola, 2019) [20]. The distribution of plastic debris is highly variable as a result of certain factors such as wind and ocean currents, coastline geography, urban areas, and trade routes. Studies globally have demonstrated the adverse impacts of plastic waste on the environment.

For instance, it can cause intestinal damage when ingested by animals and humans.

Methodology

This paper examined current progress with "Plastic waste management as a viable strategy for eradicating plastic pollution in Nigeria" through existing literature review and data collection from relevant agencies. The main purpose of this research work was to survey theoretical backgrounds and previous studies on the above subject matter and the current progress with the implementation of plastic waste management towards ensuring sustainable economic growth and development in Nigeria.

Results and Discussion

Studies have shown that there are green entrepreneurial opportunities in plastic waste management and recycling for sustainability in Nigeria. There's nothing more exciting than having fun in the plastic waste management business and making money while at it (Anabaraonye, Ewa, Anukwonke, Eni, Anthony, 2021) [4]. In Nigeria for instance, plastic pollution is causing such a tremendous nuisance that even the Federal, State and Local government authorities are finding it difficult to contain the incessant outburst. The gutters and drainages are covered with plastic waste comprising of plastic bottles, take away plates and spoons, polythene bags and many other materials in the same family. These waste in the drainage system makes it difficult for water to pass through, thus leading to flooding. This flood carries those plastic waste again to the roads and streets. When it comes to waste recycling, it's about of keeping your environment clean and generating income at the same time (Anabaraonye, Okafor & Eriobu, 2019) [2]. According to Stan Edom, "Recycling is the perfect example to use when stating that people see gold right in front of them, yet they do not know it. Recycling business ideas and opportunities are largely overlooked because of the low awareness surrounding the industry in Nigeria" (Edom 2016) [10].

Factors contributing to increasing quantity of plastic waste generated annually in Nigeria

In Nigeria, the use of sachet water, bottle water, bottle drinks, takeaway food packs, straws, cups, and spoons, among others in homes and occasions is alarming. These packages come in handy for most people and are widely accepted by many Nigerians. The wide acceptance is attributed to the fact that one doesn't really need to remain at the point of purchase or service to consume them. Nigerians eat and drink from this different packages comfortably anywhere as the need arises; hence the increase in the rate of plastic waste generation. Plastic wastes are toxic, most are non-biodegradable and hence constitute nuisance in the environment. The burning of these plastics is a common practice in Nigeria. Emeka and Lesley 2020 [11], opined that over 60 million plastic sachet water bags are consumed and disposed of daily in Nigeria, and single-use plastic shopping bags and takeaway packs are ubiquitous. Beyond toxicity of plastic waste, they find their ways to different environmental media. They pollute soils, clog drains and waterways and eventually causing an overflow of water and sewage. Subsequently, this become the breeding grounds for disease spreading germs and bacteria (Akinola, Adeyemi, and Adeyinka, 2014) [1]. Plastic bags otherwise known as poly bags or Nylon bags in Nigeria are essential parts of the everyday routine of millions of Nigerians. Plastic bags are popularly used for packaging items, shopping, and mostly single-use. Across Nigeria, the use of plastic bags is common in households, shopping malls, offices, supermarkets, local markets, schools etc. Waste plastic sachet water bags and polyethylene (cellophane) as well as other plastic products are made of non-biodegradable elements; therefore, they are not decomposable, and results to visual pollution. The use of plastic bags for shopping and storing of items is common practice in Nigerian homes, markets, and stores. They are used for wrapping and selling of varieties of consumables and other products by different vendors. Thus, sachet bags has become an increasingly important peculiar feature of the country (Emeka *et al*, 2020) [11].

Beside markets, water industries in Nigeria also make use of these bags to package drinking water. It is believed that plastic sachet water, popularly known as pure water in Nigeria was introduced by one Mrs. Victoria Bolanle Oginni in the year 1990 (Babatunde, and Biala, 2010; Azuh, 2015) [6, 5]. Since this invention, the production and consumption of sachet water has come to stay, and it is widely accepted by Nigerians. Its introduction has birthed several brands as many entrepreneurs have ventured into the business. Sachet water is affordable and widely sold in shops, kiosk, streets hawkers, parks, markets for as low as 10 naira ($0.028) in some parts of the country. This therefore generates tons of sachet water wastes daily across the country. According to the studies carried out by Edoga, Onyeji, and Oguntosin (2008) [9], 70% of Nigerians consume at least one bag of sachet water daily. This means that about 60 million plastic sachets wastes are being generated each day. In Nigeria, There is minimal involvement of local recyclers in PET recycling as a result of the manual labour that is used for chopping the plastic waste. This invariably limits the volume of shredding and results fatigue; also to maintain existing machine is expensive and difficult for local operators to afford (Ugoamadi and Ihesiulor, 2011; Okon, 2018) [21, 19]. One of the discouraging factors in setting up recycling plant is that it is capital intensive and one still need to get a piece of land for setting up a recycling center. Hanafi (2018) [13], reported that it costs about fifty million naira to import a plastic crushing machine. Since these imported machines are capital intensive, it is therefore necessary to locally manufacture recycling machines. The raw materials to manufacture this recycling machine can be sourced locally. Some of the machines produced from locally sourced materials include: a polythene recycling machine, a motorized polythene and water nylon sachet recycling machine, a pneumatically operated injection plastic molding machine with a die assembly that was simulated using ANSYS software to determine the stress, strain and temperature distribution across the die, a plastic crushing machine for commercial and industrial recycling, among others (Odior, Oyawale, and Odusote, 2012; Odusote, Muritala, and Oyawale, 2012; Kusekar, Morajkar, Kashid, Hipparakar, and Deshpande, 2015; Ikpe, and Owunna, 2017) [17, 12, 15, 14].

Benefits of plastic waste management and plastic recycling in Nigeria

Green entrepreneurial opportunities abound in the plastic waste management and plastic recycling industry in Nigeria

today. The reduction and recycling of plastic waste can help address global warming and climate change as they are potent strategies for reducing greenhouse gas emissions (Anabaraonye, Chukwuma & Eriobu, 2019) [26]. The plastic waste management and plastic recycling businesses have a plethora of opportunities in the industry. Thousands of businesses operate within several niches in its space, and they all go on to serve a varying number of clients seeking different solutions to their waste management problems (Edom 2016) [10]. When it comes to plastic waste management and plastic recycling, it's about of keeping your environment clean, eradicating plastic pollution and generating income at the same time (Anabaraonye, Chukwuma & Hope, 2019) [26]. According to Stan Edom, "Recycling is the perfect example to use when stating that people see gold right in front of them, yet they do not know it. Recycling business ideas and opportunities are largely overlooked because of the low awareness surrounding the industry in Nigeria" (Edom 2016) [10]. With the high demand for energy in homes, offices, and industries, fuel from Plastic waste can suffice. Aside energy generation, recycling of plastic waste has other benefits such as energy conservation and greenhouse gas emissions reduction otherwise known as gasification. Scavenging and recycling of plastic wastes provides a means of livelihood in developing countries like Nigeria. Recycled plastic waste could be used to produce composite materials which can be a source of revenue (Gallo, Weber, Fossi, 2016) [12]. Plastic recycling exonerates the people in communities from air, water and land pollution. It reduces the practice of open-air burning and landfill fires. Plastic recycling is a major source of entrepreneurial revolution not only in Nigeria but around the World. In Nigeria, arising from the continued proliferation of underemployed and unemployed youths in major cities and rural dwellings, these youths have taken the platforms of the waste management and recycling business to better their income and to reduce the risks of their various survival adventures. Waste recycling is a platform for employment generation, income and engine room for socio-economic development when harnessed properly (Anabaraonye, Chukwuma & Hope, 2019) [26]. While health concerns are a major issue with waste management and recycling, the economic implications of waste recycling which is a climate change mitigation strategy cannot be over-emphasized. Financial abundance and ample profits are added advantages for the few audacious and courageous individuals that can see the business opportunity in collecting the plastic wastes which go beyond striving to keep their environments clean(Anabaraonye, Chukwuma & Hope, 2019) [26]. When collecting recyclable waste, the savvy individuals in the business filter exactly what they want. You can decide to collect only plastic waste, only aluminum can wastes, only rubber wastes, any other type, or all of them. Executing recycling business ideas that focus on the collection of a particular type of waste keeps the recycler's business streamlined, makes waste collection easier, and increases the chances of profitability (Edom 2016) [10].

Recommendations

1. The place of interdisciplinary approach to solving environmental problems such as plastic pollution cannot be overemphasized. While many focus on raising awareness about plastic pollution, we should also do well to employ interdisciplinary approaches to solving this problem and this includes private-public partnership.
2. According to Nnaji (2014) [16], about 80% of residents in Nigeria lack the services of waste collectors, and therefore dispose their wastes as it pleases them. There is a great need to employ the services of both public and private waste management organizations to partner with the government agencies in proper waste collection and disposals thereby helping to eradicate plastic pollution in Nigeria.
3. Kofoworola (2007) [25], reported that more than half of the uncollected wastes in various locations in Lagos is as a result of the inefficient waste management system. Privatizing waste collection and management industries in Nigeria will go a long way in curtailing the challenges of waste management and also curb plastic pollution.
4. Plastic pollution education should be introduced in primary, secondary schools and tertiary institutions in Nigeria. Furthermore, radio jingles, poetry, print media and television adverts can be used to sensitize and educate the public on plastic pollution and innovative strategies to mitigate for sustainable development in Nigeria.

Conclusion

People across various communities and institutions in Nigeria including the young and old, male and female; should know that the environment responds as a way of feedback to all of man's activities. We must manage our environment by using our plastics sustainably, disposing plastic wastes properly and thereby eradicate plastic pollution which leads to climate change thereby achieving the United Nations Sustainable Development Goals (SDG 13).

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