



OPPORTUNITIES TO CREATE, BUILD AND EXPLORE RECYCLED RUBBER-PLASTICS FOR SUSTAINABLE TOILET DESIGN AND CONSTRUCTION IN NIGERIA

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Abstract

In recent times, the issue of waste is no more a news, but issues of waste to wealth, waste to energy, and other waste management initiatives are one of the major key drivers in sustainable environmental challenges facing humanity today, especially as far as toilet design and construction is

concerned. Yet, it is not

Keywords: Sanitation, Solution, Water, Waste management and Stakeholders.

receiving enough attention from those responsible for the planning and designing and construction of

INTRODUCTION

The Nigerian government and policy makers have come up with various strategies over the years on how the nation's social and economic potentials can be harnessed (Isa and Jimoh, 2013). The nation is still in search of solutions to its health sector challenges and sustainable waste management practices have been advocated because it has succeeded in some other countries with similar challenges. Health facilities are not adequately maintained and where maintenance is attempted, reliability centered maintenance procedure is not adopted. In the same vein, (Martin, 2001) also contributed that the private sector should not be restricted to providing services after a public agency has been deemed to have "failed". Equally, successful public authorities should

toilets in Nigeria. After a review of extant literatures on many resource materials, a list of factors, criteria and determinants were identified in order to provide strategic solutions to Nigeria's rubber-plastic waste problems such as reduce, recycle, repurpose, rethink and reuse. A good knowledge of the generation, transportation, collection/disposal, treatment/recycling and general management will go a long way towards helping the environmentalists in planning, designing and construction, to handle the problems associated with recycled rubber-plastic products. Also, in Nigeria, some states have not actually migrated to the next higher level in terms of hygiene as open defecation free (ODF) area. As a result of this, the Federal, State and Local governments are presently trying to achieve safe hygiene practices for a collective responsibility, sustainable waste management and benefits to the society using recycled rubber-plastic products. However, the management and operation of such sanitary facilities are too much of a heavy burden to bear due to some circumstances. Therefore, the main objective of this paper is to examine the issues and challenges facing the waste management of toilet facilities using recycled rubber-plastic products to proffer evidence based solution to the design and construction of toilet facilities through a sustainable clean water and sanitation using appropriate methodology. In conclusion, a detailed study with relevant qualitative analysis showed acceptable positive results using recycled rubber-plastic products for opportunities to create, build and explore toilet design and construction initiatives. It was then recommended among others that at all levels, stake holders should fund, develop and promote health sector of the economy in terms of supporting toilet facilities like hand washing, easy design, construction and renovations of temporary and permanent toilets internally and externally, private or public.

not be excluded from helping improve services delivered by other public providers. Sanitation marketing is an approach to household sanitation promotion that aims to create sustained and effective sanitation by stimulating household demand for sanitation products and services (Scott, Jenkins & Kpinsoton, 2011). Thousands of pieces of trash that would otherwise be clogging waterways and landfills causing pollution, erosion, irrigation blockages, and health problems in Nigeria have been turned into sturdy and surprisingly attractive

construction materials (Jennifer, 2011). Typical examples of these are recycled plastic products from plastic bottles and nylon sachets, e.t.c.

OBJECTIVES

The objectives of this paper are to:

1. Examine how Nigeria can successfully adopt sustainable waste management as a policy option in the ongoing health sector reform.
2. Achieve a sustainable, most effective, productive, compassionate, result-oriented and efficient use of recycled rubber-plastic toilet products and resources.
3. Ascertain and maintain accepted sanitation standards with available waste materials.

STATEMENT OF PROBLEM

There are numerous challenges facing the waste management of toilet facilities. One of the identified ways out is using recycled rubber-plastic products to proffer evidence based solution to the design and construction of toilets through a sustainable clean water and sanitation. It will therefore develop and promote health sector of the economy in terms of toilet facilities made from recycled rubber-plastic products like rubbers, old tyres, plastic bottles and nylon sachets, e.t.c. for easy design, construction and renovations of temporary and permanent toilets internally and externally, private or public.

LITERATURE REVIEW

Nigeria is a country which places a great emphasis on cleanliness. A decree from the days of military government which is still in force mandates that the final Saturday of every month is [Sanitation Day](#), meaning that travel is banned and a curfew enforced until 10am. Families are told to use the time when they are confined to tidy the home. Unfortunately, once household waste is tidied, the problems begin. Nigeria's booming population, an asset in economic growth terms, is placing great pressure on solid waste management (SWM) systems which are in many cases already either antiquated, informal or non-existent (Guardian News, 2016).

About 70 million people, out of a population of 171 million, lacked access to safe drinking water, and over 110 million lacked access to improved sanitation in 2013. Open defecation rates, at 28.5 per cent pose grave public health risks. Every year, an estimated 124,000 children under the age of 5 die because of diarrhoea, mainly due to unsafe water, sanitation and hygiene. Lack of adequate water and sanitation are also major causes of other diseases, including respiratory infection and under-nutrition (World Bank, 2009).

Nigeria has recorded practically no progress in the area of sanitation in the last 25 years according to the WHO/UNICEF (JMP) 2015 report on progress towards achieving access to safe water and basic sanitation. The report noted that: "In 1990, 38 per cent of the population had access to improved sanitation. In 2015, this figure is now a woeful 29 per cent (up just a meager 1per cent from 2014's figure of 28 per cent). The proportion of Nigeria's population that has gained access to improved sanitation since 1990 is only 9 per cent."

The federal government according to the same report has not met the national target it set to ensure 75 per cent of its population had access to safe water by 2015. Better results had been recorded in the area of water provision and have met the MDG target for water which was to halve the number of people without access to safe water, but the SDG number six on clean water and sanitation is still pending (Olabode, Kayode, Hilary and Elizabeth, 2014). Also, the waste in the Urban EcoSystem should be properly managed (Sridhar and Hammed, 2014).

There are ways in which the public and private sectors can join together to complement each other's strengths in providing education services and helping developing countries to meet the Sustainable Development Goals (SDG) waste management and to improve learning outcomes which can even be tailored and targeted specifically to meet the needs of low-income communities (World Bank, 2009). Recently, an interesting alternative to creating septic tanks with re-use materials has proven to help in controlling sanitation problems and regulate waste disposal at low cost (thedomesteadsurvival.com, 2015). Bottle houses take this dangerous waste out of the environment and make it useful in building a house using earth-filled [plastic bottle](#) 'bricks' and mud (Ugochi, 2011).

JUSTIFICATION

The private sector be it internationally operating large scale enterprises, social entrepreneurial programmes or small and micro-scale businesses of masons, plumbers, cleaners, empties or wholesalers has often been ignored as a reliable alternative or addition to public service providers in the sanitation supply chain sector. As a consequence, the sustainable waste management practices and resources available for toilet construction, modernization, and renovation have become a significant issue in Federal, State and Local governments of Nigeria to improve more on health buildings and other sanitary facilities with the use of recycled rubber-plastic resources and products.

MATERIALS AND METHODS

Materials for the sub-structure are as follows:

1. 190 Plastic Bottles and 9 truck old tyres

2. One 12 metres Iron bar (4.8mm)
3. One 12 metres Iron bar (6mm)
4. Two rolls of rubber twines
5. One and a half bag of Cement
6. Five wheel barrows of sand and laterite
7. Two wheel barrows of Gravels
8. Four 90° 100mm PVC quarter bend connectors pipes
9. Three 100mm PVC pipes
10. Availability of water

Methods of building the sustainable Superstructure using are as follows:

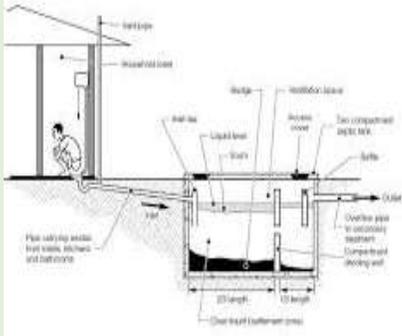
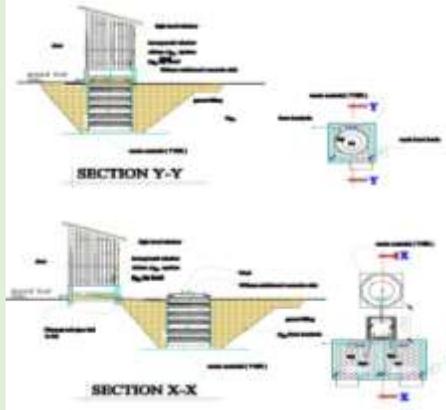
1. After obtaining all the above mentioned materials for the substructure, the site for the toilet construction will be determined for clearing and setting-out which will be followed by the digging of the toilet trench. The septic tank must be installed next to the toilet to avoid bends in pipes, and at a lower level of terrain, away from water wells. The minimum distance from a source of water is 50 metres, so that there will not be any contamination of the water in the event of a leak.
2. Put the materials together following a step-by-step approach. First, puncture the tires on the spots then; apply sealer gum between the tires before screwing them together. The purpose is to seal the modules, in order to prevent the sewage to spill.
3. The next step is to finalize the trench that will receive the materials. The trench should measure approximately 1.4m depth, 1.5m width and 3m length.
4. Make two rings and two reinforced concrete caps to install the pipe and close the septic tank. Use iron, sand, cement and gravels. Prepare the concrete and place it in the shape of the diameter of the entire circumference, with 14cm of height. The shape of the ring must have a way in and a way out for a 100mm pipe. The lids must have the same circumference of the tyre and be 5cm thick, well arranged to provide proper substructure and leaching. One of them will be compact and the other will have a central hole of 0.5 inch.
5. Place the materials in the trench. The bottom of each module must be compressed to receive a layer of concrete with at least 5cm.
6. Install the access for the PVC pipe and 90° quarter bend with 90cm of depth. Install the exit pipe at the height of the first module and insert a 90° elbow on its end. That is 1.5m of tube, 20cm of which into the second module. On the end of it, install another 90° elbow and a tube with 90cm depth. The tube that will serve as a drain will be installed at the height of the second module. Next, apply sealer gum between the tyres.

7. Prepare a trench to bury the drain. The depth should be compatible with the slope of the terrain. Apply a layer of sand and gravel on the base. Before installing the 6m tube, make several holes 2m up from its edge, so that the liquid generated at the end of the process can infiltrate the soil.
8. Install the lid with a central hole in the first module and the compact lid in the second module. You must also install a pipe into the hole on the lid of the first module, with diameter of 0.5 inch and height of 1.5m, in order to release the gases that will be generated in the process. It must point upwards.
9. The final stage is to connect the first module to the toilet, using a 100mm tube. The length of the tube must observe the distance between the toilet and the first module. After the substructure and mid structure, the superstructure will be made of recycled plastics filled with wasted nylons, strategically arranged and binded with twines and mortar. (See Table 1, Plates B and D).

ANALYSIS

This paper employs descriptive case study using qualitative analysis to achieve its objectives. Therefore, the existing situation and proposed situation involved carefully selected professionals and experienced staff with in-depth interviews of senior health workers and other stake holders in the immediate society for validation as summarized in Table 1.

TABLE 1: PLATES SHOWING EXISTING SITUATION VIS-À-VIS THE PROPOSED SITUATION OF RECYCLED RUBBER-PLASTIC TOILET AS SHOWN IN PLATES A-D

	EXISTING SITUATION	PROPOSED SITUATION
/	<p>PLATE A: SHOWS THE OLD TOILET SECTION</p> 	<p>PLATE B: SHOWS THE NEW RECYCLED PLASTIC TOILET SECTION</p> 

DESIGN

CONSTRUCTION

PLATE C: SHOWS THE OLD CONSTRUCTION VIEW



PLATE D: SHOWS NEW RECYCLED PLASTIC TOILET WALL



Source: Field Work, 2020

Deduction:

In relation to the current health facility issues in the community, that is not maintained, repaired nor replaced, the expected outcomes as a result of partnering developments is that since government alone cannot afford to provide all the maintenance of health facilities needed for the hygiene of the environment and thus, there is the call for intervention of the sustainable waste management practices. Also, the current sanitation condition Nigeria is going from good to bad, but by going along standards and best practices, the expected positive result using positive development and global best practices was proffered (interview: Junior Officer). It is now clear that government alone cannot provide all the health facilities needed for the sanitation of the country by 100%. Thus, there is a very strong call for collaboration of the private and public sector by using the ample opportunities in recycled rubber-plastic resources and products for creating, building and exploring sustainable toilet design and construction in Nigeria.

FINDINGS

- Physical visitations to the case study areas in the immediate environment shows that existing toilet facility are grossly inadequate without proper maintenance culture and affordability, hence the need for the use of waste materials such as recycled rubber-plastic resources and products.
- Interviews carried out with stakeholders in the community to know how they perceive healthy living suggested that there is little awareness to the concept of reduce, recycle, repurpose, rethink and reuse.
- Features of various toilet features in our metropolis showed that their conditions can be improved upon to enhance sustainable clean water and sanitation and upgrading from standard to higher definition with the use of

waste materials such as recycled recycled rubber-plastic resources and products.

POLICY RECOMMENDATIONS

The following recommendations will be very important in the present and future situations as strategies for sustainable waste management practices.

1. The government of the day should provide enabling environment to allow for the private sector to partner and provide adequate job security as the country can progress positively with waste materials such as recycled rubber-plastic resources and products.
2. Stakeholders in Public and Private Participation should sponsor and organize massive enlightenment programmes, workshops, conferences, seminars and symposia in collaboration with all the media houses. As a result of these, training and re-training will take place while health is revamped by sustainable waste management practices.
3. Appropriate application of 4 Rs (Recycle, Reduce, Reuse and Rethink) is also called materials salvage, recovery and [reprocessing](#) of waste materials for use in new products. These basic phases in recycling are the collection of waste materials, their processing or manufacture into new products, and the purchase of those products, which may then themselves be recycled. Typical materials that are recycled include iron and steel scrap, aluminum cans, glass bottles, paper, wood, plastics, tyres and many other building materials (Construction site waste management, 2007).

CONCLUSION

The present low private participation in sustainable waste management practices could be linked to the attitude of the government towards the private sector and the lack of interest on the part of private sector because it views health as a non-profit investment. The smart toilet architecture deals with all the relevant aspects of internal and external considerations of providing a comfortable and healthy space to defecate and move from open defecation to open defecation free between 2025 to 2030 (Abdulmageed, 2018). The need to participate in the funding, sustainability and provision of recycled resources and products such as used old tyres, plastics and nylons for health reasons will ensure achievement on the national health objectives and then there has to be a collaborative efforts by Government and non-Government organization in order to safe guard the major parameters raised in this paper in order to create, build and explore sustainable toilet design and construction in Nigeria.

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