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ASSESSMENT OF THE ENVIRONMENTAL IMPACT OF DUMPSITES IN LAPAI TOWNSHIP AREA, NIGER STATE, NIGERIA: A REVIEW

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ABSTRACT

Waste management remains one of the most pressing environmental challenges in developing countries, with Nigeria facing significant problems due to rapid population growth, urbanization, and weak enforcement of environmental regulations. This study assessed the environmental impact of dumpsites in Lapai township, Niger State, with emphasis on the types and sources of waste, location and characteristics of major dumpsites, and their implications for the environment and public health. Findings indicate that waste in Lapai is dominated by household, agricultural, commercial, and biomedical sources, most of which are indiscriminately dumped in open and unmanaged sites. Such practices result in soil contamination, groundwater pollution, air quality degradation, biodiversity loss, and widespread health issues among residents. The study further identified socio-economic consequences, including increased healthcare costs, decline in property values, reduced agricultural productivity, and heightened poverty. Current waste management practices were found to be largely inadequate, hindered by poor infrastructure, weak institutional capacity, and low public awareness. The study concludes that sustainable waste management strategies such as waste segregation, recycling, development of engineered sanitary landfills, and policy reforms are necessary to mitigate these impacts. The findings provide evidence-based recommendations for policymakers, local authorities, and environmental stakeholders in aligning Lapai's waste management practices with global best standards and sustainable development goals.

Keywords: Assessment, Environmental Impact, Dumpsites, Waste Management Strategies, Sustainability, Lapai Township Area.

Introduction

Waste management remains one of the most pressing environmental challenges confronting developing countries, particularly Nigeria. Rapid population growth, urbanization, and industrialization have contributed significantly to the increasing rate of solid waste generation, while poor infrastructure, inadequate funding, and weak enforcement of environmental regulations have worsened the situation (Abila & Kantola, 2013). In many Nigerian cities and towns, solid waste management practices are still dominated by open dumping, burning, and indiscriminate disposal in drains, streets, and open lands (Ogbonna et al., 2007). This improper handling of waste has resulted in serious environmental hazards such as land degradation, air pollution, water contamination, and the spread of communicable diseases (Adewumi, Ogedengbe, & Adepetu, 2005). Unlike developed nations that rely on modern sanitary landfills, recycling, and waste-to-energy technologies, Nigeria's waste management system is largely characterized by inefficient collection, inadequate disposal sites, and limited public awareness (Olanrewaju & Ilemobade, 2009).

Lapai Local Government Area (LGA), situated in southeastern Niger State, Nigeria, encompasses a rich historical and cultural heritage. The town of Lapai, serving as the LGA's administrative center, is located near the Gurara River, a tributary of the Niger River. Lapai has a long history dating back to pre-colonial times when it was a significant center of the Gwari people. The town later became part of the Nupe Kingdom and played a role in the trade routes that traversed the region. Today, Lapai is home to a diverse mix of ethnic groups, including the Gwari, Nupe, Hausa, and Fulani, each contributing to the cultural tapestry of the town. Lapai town, the headquarters of Lapai Local Government Area in Niger State, exemplifies the waste management challenges facing semi-urban communities in Nigeria. With a growing population due to educational institutions, notably the Ibrahim Badamasi Babangida University (IBBU), and expanding economic activities, the town generates substantial amounts of municipal solid waste daily. However, waste disposal practices in Lapai are mostly unsystematic, with open dumpsites scattered around residential neighborhoods, marketplaces, and road networks. These dumpsites, often unmanaged and poorly located, serve as the primary means of solid waste disposal for households and commercial establishments. Such methods not only compromise the aesthetic quality of the environment but also expose residents to multiple health and ecological risks, including groundwater pollution, vector infestation, foul odor, and reduced air quality (Awosusi, 2010).

Types and Sources of Waste in Lapai

Household Waste in Lapai

Household waste, often referred to as municipal solid waste (MSW), constitutes the largest proportion of waste generated in Lapai township. With a population that has grown steadily due to urbanization and the establishment of educational institutions such as Ibrahim Badamasi Babangida University (IBBU), the volume of waste from households has increased significantly. Household waste includes biodegradable and non-biodegradable materials such as food residues, vegetable peels, paper, plastics, textiles, glass, and cans. The predominance of organic waste in Nigeria's household waste stream, estimated to constitute 50–70% of municipal solid waste, is consistent with what is observed in Lapai (Adewumi, Ogedengbe, & Adepetu, 2005).

Another critical factor in household waste generation is the lack of awareness and cultural attitudes toward waste management. Many households in Lapai do not practice waste segregation, leading to a mixture of organic and inorganic materials at dumpsites. Additionally, with the increasing consumption of packaged food, bottled water, and sachet water (commonly called *pure water*), the presence of plastic waste has escalated, creating long-term environmental challenges because plastics take decades to decompose (Adeolu, Enesi, & Adeolu, 2014).

Thus, household waste in Lapai is both a social and environmental issue that requires urgent intervention. Improved waste management policies, provision of adequate waste bins, and sensitization of residents toward proper disposal practices could reduce the environmental impact of household waste in the township.

Fig. 1.0: Household Waste

Agricultural Waste in Lapai

Agricultural waste forms a significant portion of the waste stream in Lapai township, given the community's predominantly agrarian economy. The town and its surrounding villages are known for farming activities such as rice, maize, sorghum, millet, yam, and cassava cultivation. As a result, agricultural residues, including crop stalks, husks, peelings, and animal dung, are generated in large quantities. According to Okukpon and Adejumo (2018), agricultural waste constitutes up to 40% of solid waste in rural and semi-urban Nigerian communities, highlighting its significance in Lapai's waste profile.

Animal rearing also contributes to agricultural waste in Lapai. Livestock waste such as poultry droppings, cow dung, and goat feces is commonly found in residential and market areas. These wastes, when improperly managed, create offensive odors, attract disease vectors, and pollute surface and groundwater sources. Additionally, fish farming activities within Lapai and nearby villages produce organic sludge and wastewater that often flow into the environment without treatment.

Despite its challenges, agricultural waste has enormous potential for resource recovery. For instance, crop residues can be used in biogas production, livestock dung can be composted, and cassava peels can be processed into animal feed. However, such sustainable practices remain underutilized in Lapai due to lack of investment and awareness (Abila & Kantola, 2013). Addressing the management of agricultural waste in Lapai is crucial not only for environmental protection but also for enhancing food security and income generation.

Fig. 2.0 Agricultural waste

Commercial and Industrial Waste in Lapai

Commercial and industrial waste is another significant source of waste in Lapai township, driven by the growth of local businesses, markets, and small-scale industries. As a commercial hub serving surrounding rural communities, Lapai hosts several marketplaces where goods such as food, clothing, electronics, and household items are traded. The commercial activities generate various forms of waste, including food residues, packaging materials (plastics, nylon bags, cartons), textiles, and scrap metals. According to Achi, Adeofun, and Oyediran (2012), commercial waste in Nigerian towns can contribute up to 20–30% of total municipal solid waste, particularly in towns with busy market centers like Lapai.

One of the most visible sources of commercial waste in Lapai is the central market, where traders dispose of unsold or spoiled perishable goods. Piles of vegetable waste, fish remains, and animal by-products are often seen dumped near trading areas, leading to foul odors and unsanitary conditions. In addition, packaging waste such as plastics and polythene bags accumulates rapidly, posing environmental hazards because of their persistence and resistance to decomposition (Adewole, 2009).

A major challenge is the lack of waste segregation and recycling initiatives in the commercial and industrial sectors. Materials such as plastics, scrap metals, and sawdust could be repurposed for other uses, but in Lapai, they are often discarded at dumpsites or left in open spaces. Addressing this issue requires encouraging sustainable business practices, providing waste collection facilities in markets, and supporting small-scale recycling initiatives.

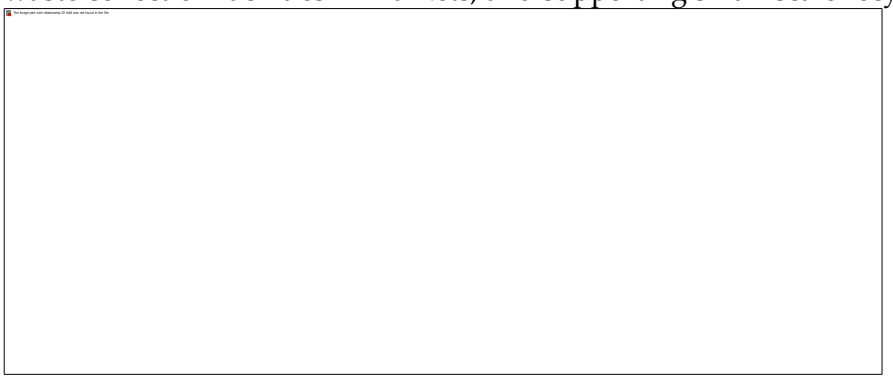


Fig. 3.0 Commercial waste

Biomedical and Hazardous Waste in Lapai

Biomedical and hazardous waste, though not as voluminous as household or agricultural waste, poses serious health and environmental risks in Lapai township. Biomedical waste

refers to waste generated from hospitals, clinics, laboratories, and pharmacies. In Lapai, health facilities such as the General Hospital, private clinics, and community health centers produce biomedical waste including syringes, bandages, needles, expired drugs, surgical gloves, and pathological waste. Studies in Nigeria have shown that biomedical waste accounts for approximately 10–25% of healthcare facility waste, of which a significant portion is hazardous (Coker et al., 2009).

Beyond biomedical waste, hazardous waste in Lapai also includes used batteries, e-waste from mobile phones and electrical appliances, pesticides, fertilizers, and chemicals from small workshops. These wastes contain toxic substances such as lead, cadmium, and mercury, which pose long-term risks to human health and ecosystems (Osibanjo & Nnorom, 2007). For example, indiscriminate disposal of used batteries and e-waste in open dumpsites contributes to soil and water contamination, while open burning releases toxic fumes that degrade air quality.

Waste Classification

Sources of waste generation in Nigeria include but not limited to commercial, industrial, household, agricultural and educational establishments. The solid waste types include paper, nylon, wood, dust, cloth, metal scraps, electronic gadgets, bottles, food remnants and vegetables; saw dust, ashes, rubber, bones, plastics and sewages.

Solid Wastes: – Solid waste is classified into garbage and rubbish. Garbage is purified waste from food such as meat, fish, fruits and vegetable among others while rubbish are non-perishable wastes that are combustible such as paper, carton, wood, clothes, polythene, iron, glasses and ceramics.

Liquid Effluent Wastes:– These are wastes generated from the household domestic activities and industrial effluents which are liquid or semi-liquid in nature. Most of these effluent wastes from the industrial sites are hazardous to human health.

Gaseous Wastes:–These are waste generated from the household and industrial sites which are gaseous in nature. Gaseous waste includes the following: Sulphides, Carbor (IV) oxides (CO_2), carbon monoxides etc.

On a general note, the type of wastes generated may be biodegradable/non-biodegradable, hazardous/ non-hazardous, recyclable or non-recyclable. Before the advent of industrial revolution, the major generation of wastes was mostly biodegradable. But now, due to increase in population and change in life style, the amount and nature of waste have changed drastically. In recent years, the waste generated from industries, health care centers and residents are becoming more hazardous due to their non – biodegradable nature and increase in chemical composition.

Generally, waste exists in three main states: Solid, Liquid and Gas. Gaseous type of waste is rarely found in homes, it is usually peculiar to large-scale industries, while liquid and solid waste are part of common domestic waste. Industrial waste could also be in liquid or solid form. It has been observed that the nature of waste generated in urban areas is usually different from that of rural areas (Zaman 2014).

Environmental Impacts of Dumpsites

Dumpsites, also known as open landfills or waste disposal sites, pose significant environmental hazards due to improper waste management practices. These sites contribute to air, water, and soil pollution, negatively affecting ecosystems, human health, and climate stability. The following sections discuss the major environmental impacts of dumpsites, supported by scientific evidence and research.

1. Soil Contamination

Dumpsites introduce hazardous substances into the soil, including heavy metals (e.g., lead, mercury, cadmium), chemicals, and organic pollutants (Ferronato & Torretta, 2019). These contaminants alter soil composition, reduce fertility, and disrupt microbial activity, making the land unsuitable for agriculture. Leachate—a toxic liquid formed from decomposing waste—seeps into the soil, further exacerbating contamination (Kumar & Sharma, 2020).

2. Water Pollution

Leachate from dumpsites often infiltrates groundwater and surface water bodies, contaminating drinking water sources. Studies indicate that dumpsite leachate contains high concentrations of nitrates, phosphates, and heavy metals, which can cause severe health issues such as cancer and kidney damage (Mor et al., 2018). Additionally, plastic waste in dumpsites breaks down into microplastics, which enter water systems and harm aquatic life (Rochman et al., 2019).

3. Air Pollution and Greenhouse Gas Emissions

Decomposing organic waste in dumpsites releases methane (CH_4), a potent greenhouse gas that contributes to climate change. Methane has a global warming potential 25 times higher than carbon dioxide (CO_2) over a 100-year period (IPCC, 2021). Open burning of waste at dumpsites emits toxic fumes, including dioxins and particulate matter (PM2.5), which cause respiratory diseases and smog (WHO, 2018).

4. Biodiversity Loss

Dumpsites disrupt local ecosystems by altering habitats and introducing toxic substances. Wildlife, including birds and scavengers, often ingest plastic and hazardous waste, leading to poisoning and death (Gall & Thompson, 2015). Soil and water contamination also affect plant growth, reducing biodiversity in surrounding areas.

Health Risks to Nearby Communities

Communities living near dumpsites face increased risks of respiratory diseases, skin infections, and cancers due to exposure to pollutants (Giusti, 2009). Children are particularly vulnerable to lead and chemical exposure, which can impair cognitive development (Landrigan et al., 2018).

Dumpsites significantly degrade the environment through soil, water, and air pollution, while also contributing to climate change and health hazards. Sustainable waste management strategies such as recycling, composting, and controlled landfills—are essential to mitigate these impacts. Governments and organizations must enforce stricter waste disposal regulations and promote public awareness to reduce environmental damage.

Health Consequences of Unhygienic waste management practice

The impact of waste materials on health is varied and may depend on numerous factors including the nature of the waste, duration of exposure, the population exposed, and availability of prevention and mitigation interventions by government and private sectors (Boadi and Kuitunen 2015). The impacts may range from mild psychological effects to severe morbidity, disability or death. The literature on health impacts of waste exposure remain weak and inconclusive in many cases due to the difficulties encountered in accurately ascertaining exposure, controlling for confounders, accounting for duration of exposure and inability to follow up those exposed to ascertain outcomes that do not manifest in the short term (Antwi, 2015). Meanwhile, certain health impacts might be immediate, obvious to detect and directly linkable to the solid waste exposure, others may be occult, longer term and difficult to attribute the effects to a particular type of waste (Antwi, 2015). Epidemiological data are to some extent lacking due to the complexity involved in measuring exposure and outcomes but also the limited programmatic focus and funding.

According to Nguyen (2011), many cities in developing countries face serious environmental degradation and health risks due to the weakly developed municipal solid waste management system. Several studies have been conducted in order to examine the health and environmental effects arising from waste dumps. Such studies showed that a link exists between the two (Aatamila, 2010; Giusti, 2009; Nwanta & Ezenduka, 2010). The conclusion from this and other studies has led to an increasing interest of researchers in the study relating to environmental pollution as well as its effects on plants and animals. Apparently, most of the disease outbreaks these days are as a result of the consequences of poor waste management. Furthermore, health issues such as dengue, fever, Hepatitis, tuberculosis, malaria, pneumonia, and also poor sanitation due to poor waste management. Due to poor waste management by the authorities, availability of clean and safe water is minimized because people threw rubbish at the river and the quality of living will decrease.

Residents living next to dump sites are usually affected by stench, the sight of marauding scavenging animals and social stigma. In extreme cases, solid waste has been reported to contain human body parts or aborted fetuses which may be distressing and could affect the mental well-being of the residents and those involved in waste picking. Moreover, for those who live closer to the dumping sites, the nuisance of scavenging animals and birds may affect their emotional and psychological health (Al-Delaimy, Larsen &Pezzoli, 2014). Heavy metal poisoning has also been associated with mental disorders. . In sum, careless dumping of waste usually results in the following:

1. Pollution of water: both rural and urban drinking water source come largely from surface streams and rivers .This makes them susceptible to easy pollution and contamination by carelessly dumped wastes.
2. Outbreak of epidemic: outbreak of epidemiological diseases such as cholera, typhoid fever, guinea worm infections, hepatitis dysentery etc.
3. Poor sanitary condition of urban areas: invasion of residential, institutions and commercial housing units by such pests as flies and rodents leading to food poisoning.
4. Other notable problems include: shortage of fish resources, shallowness, siltation, and drying of streams, blocking roads, alleys and pavements.

2.9 Waste Collection and Disposal

Waste can be recycled/managed using the following method:

i. Physical Method
ii. Chemical Method
iii. Biological Method
iv. Incineration and Pyrolysis

Physical Method

This is the process of separation of waste stream without any change in the chemical structure of the constituent material that will be detoxified or destroyed by high temperature

Incineration

It is used in the separation of hazardous wastes from non- hazardous wastes so that they can be treated in a more concentrated form. It is very important in most integrated waste regardless of the nature of the waste material or technology used for destruction. The necessary operation in this method includes screening, sedimentation, floating, filtration, centrifugation, dialysis, electro- dialysis etc.

Chemical Method

Chemical method is the method that alters the chemical structure or constituent of waste in the act of producing less hazardous materials. It is important because it produces minimal air emissions. The five chemical treatments are:

i. Neutralization: This reduces the acidity and alkalinity of waste streams.
ii. Ion Exchange: Used in removing ions obtained in solution from inorganic materials.
iii. De-Chlorination: This involves the process of removing chlorine from chlorinated compounds e.g. Polychlorinated biphenyl's (Pebs) or use of mat ethic sodium reagent to break the chlorine bond.
iv. Oxidation Reaction: it is the process of detoxifying toxic wastes in which the chemical bonds are broken through the passage of electrons from one reactant to the other.

Biological Method

This is the generic name used to classify the use of micro-organisms to decompose organic wastes either water, carbon (IV) Oxide and simple inorganic substances into simpler organic substances e.g. aldhydes and acids. It is believed that there is a micro-organism present in biological process in the incoming waste and inject into waste the harmful micro-organism. This helps to control growth and activities of an organism in an environment. It also helps in

maintaining high concentration of the micro-organism in contact with waste. five conventional biological methods are:

a. Treatment with activated sludge: This involves exposing waste to a biological sludge that is continuously extracted from the classified waste stream and recycled.
b. Aerated Lagoon method: Waste is agitated with air in large enclosure to increase oxygen depletion in biological oxidation.
c. Using Tricking filters: Waste is allowed to trickle through a bed of rocks coated with micro-organism that alter the waster compound by using them as food.
d. Waste stabilization bonds: These ponds are placed where wastes are allowed to decompose over long periods of time, Aeration is provided only by wind action.
e. Anaerobic Digestion: This is a method of decomposing organic matter by using anaerobic organism in closed vessels in the absence of air. Methane may be produced in the process. (Osinem, 2005).

Incineration and Pyrolysis

According to Osinem (2005), incineration reduces the volume of toxicity of organic wastes by exposing them to high temperatures. When organic wastes are subjected to high temperature 80 – 300oc, they will break down to simpler and less toxic forms. When heated in presence of oxygen, combustion will take place. This is referred to as incineration. However, when it is subjected to non-oxygen existence, it is known as pyrolysis. The products are simpler organic compounds which may be incinerated as charcoal or ash.

Open Dumping

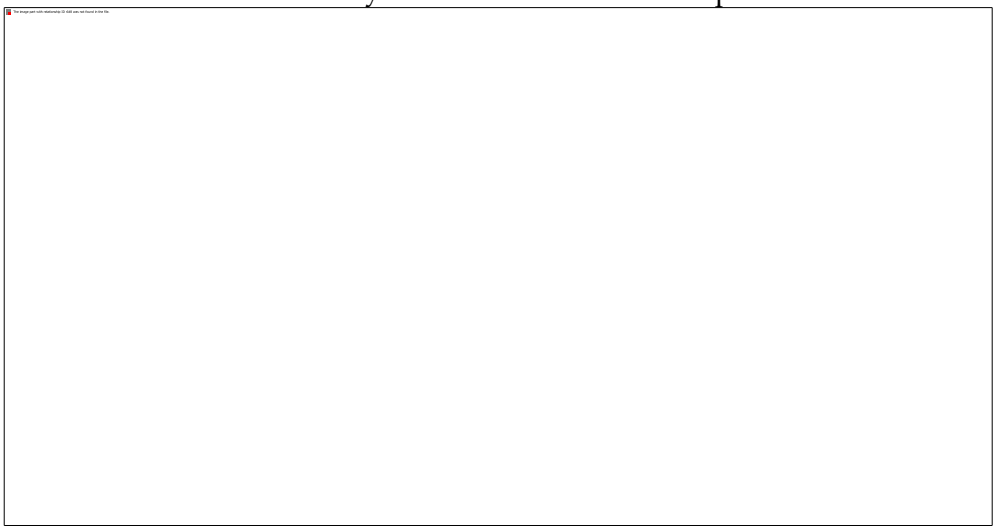
Open dumping is the most widespread method of solid waste disposal in the region and typically involves the uncontrolled disposal of waste without measures to control leachate, dust, odour, landfill gas or vermin. In some cities, open burning of waste is practised at dump sites. More so, an additional hazard on uncontrolled dump sites arises from the build-up of landfill gas (predominantly methane), which has led to outbreaks of fire and to adverse health effects on workers and adjacent residents

Importance of Waste Management

Effective waste management strategies are basic requirements for ecological sustainable development. Effective waste management strategies assist in minimizing or avoiding adverse impact on the environment and human health while allowing economic development and improvement in the quality life. The ever increasing consumption of resources results in huge amounts of solid wastes from industrial and domestic activities which pose significant threats to human health (Foday, 2013). However, the ills of inappropriately disposed municipal solid wastes are quite numerous to be mentioned. Health deterioration, accidents, flood occurrences, and environmental pressures are just a few of the negative effects. Some of the advantages of proper waste management are discussed below:

i. Proper waste management conserves the resources of water, raw materials and nutrient, control the pollution of water, air and sediments, enhances business performance and maintain corporate social responsibility, and improve occupational health and safety. Many government and organizations adopt “zero waste” policies which aim to reducing wastes at the sources through product design and producer responsibility.
ii. Preserves the aesthetic beauty of the environment and ensure favourable living and working condition for man.

iii. Avoids 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 or to the safety or welfare of animal and plants.



Municipal Waste Collection

For the purpose of safe waste collection and clean environment, state governments should enforce new strategies which prohibit littering of municipal solid waste in cities towns and urban areas. The following steps shall be taken by the municipal authority

Reuse and Recycling

There has been an emergence of biodegradable solid waste in the production of organic fertilizer and possible use in the production of biogas. Some researchers have studied the great potentials in Nigeria's municipal solid wastes to produce enormous amount of methane gas (Yusuf & Oyewumi, 2008). Mixtures of manure and ashes from burning of urban solid wastes have been used for soil amelioration to boost agricultural productions in Jos (Pasquini & Alexander, 2003). Abeokuta alone generates 2 288m3 of wood wastes per day from saw mills activities (Aina, 2006).If each state in Nigeria generates equal amount of wood wastes, then 82 368m3 of wood wastes will be generated in the country per day, and 30 064 320 m3s annually. Resource from wood wastes alone could meet more than Nigeria's needs in the wood-based raw materials for such industries as potash industry, since African wood species have been studied to have potentials for generating good amount of potash (Adewuyi, 2008).

Solid Waste Collection

Several states in the country are coming up with various means of waste collection initiated by both public and private sectors, although the effectiveness of this is largely a function of location, and where the collection is done by private sectors, it is a function of income of the owner of the wastes to be able to pay the amount charged. This usually affects the collection processes. More so, existing waste collection and transport systems often cannot handle the amount of wastes generated by large cities with growing populations. When this occurs, waste is disposed of in uncontrolled dumps or openly burned. This type of unmonitored and uncontrolled waste disposal has negative consequences on human health and the environment.

River Dumping

River dumping usually involved waste from riverside houses, urban runoffs storm drains, debris, sewage sludge, dredge materials, waste chemical and also garbage. Most of the dumping activities are illegal while some are controlled and regulated by government agencies. River dumping was a common practice before countries over the globe began to ban the activities. Even after the prohibition, dumping into water bodies persists in the area where waste collection service is not properly practised. In some regions, although there are designated dumping areas for slaughterhouse, hazardous and biomedical wastes, the legislation are ineffective to curb illegal dumping onto water bodies affecting the health of aquatic organism and also detrimental to human health.

Waste Prevention

Waste prevention often called source reduction means reducing waste by not producing it. Example of waste prevention include purchasing durable, long lasting goods and seeking products and packaging products that are 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.

Final Disposal of Generated Waste

Most of the municipal solid wastes in under-developing countries are dumped on land in a more or less uncontrolled manner. Such inadequate waste disposal creates serious environmental problems that may impair health of humans and animals and cause economic and other welfare losses. The environmental degradation caused by inadequate disposal of waste can be expressed by the contamination of surface and ground water through leachate, soil contamination through direct waste contact or leachate, air pollution by burning of wastes and the spreading of diseases by different vectors.

Ultimately, financial and institutional constraints are the main reasons for inadequate disposal of wastes especially were local governments are weak or underfinanced and rapid population growth continues. Financing of safe disposal of solid waste poses a difficult problem as most people are willing to pay for the removal of the refuse from their immediate environment but then "out of sight – out of mind" are generally not concerned with its ultimate disposal. The present disposal situation is expected to deteriorate even more in the near future because till now the relative central location of the dumping sites, i.e. close to the collection area, and the often missing management efforts, has enabled governments to dispose of the municipal solid waste at little cost. This will change soon as with rapid urbanization, settlements and housing estates now increasingly encircle the existing dumps and the environmental degradation associated with these dumps directly affect the population. Waste disposal sites are therefore also subject to growing opposition and it is becoming increasingly difficult to find new sites which find public approval and which are located at a reasonable distance from the collection area.

Recommendations for Sustainable Waste Management in Lapai

Improved Waste Segregation and Recycling

One of the most critical steps toward sustainable waste management in Lapai is the introduction of systematic waste segregation at the source. Currently, household, commercial, agricultural, and biomedical wastes are indiscriminately mixed together at dumpsites, which complicates handling and increases environmental and health risks. Segregation into biodegradable, recyclable, and hazardous categories would not only facilitate proper disposal

but also enhance resource recovery. For instance, organic waste from households and markets could be composted into organic fertilizer, which would support Lapai's predominantly agrarian economy, while plastics, glass, and scrap metals could be recycled or repurposed (Adewumi, Ogedengbe, & Adepetu, 2005). Establishing designated collection bins and drop-off points for recyclables across neighborhoods and markets would create an organized system, while encouraging small-scale recycling enterprises would generate employment opportunities. In addition, informal waste pickers, who are already active in scavenging recyclables, could be integrated into a more formal recycling chain with safety training and protective equipment (Wilson et al., 2012).

Public Education and Awareness Campaigns

Sustainable waste management cannot succeed without public participation. In Lapai, low awareness and cultural attitudes toward waste disposal remain major obstacles. Many residents are unaware of the environmental hazards of indiscriminate dumping or burning of waste, and compliance with sanitation rules is often minimal. Public education campaigns using community radio, schools, religious institutions, and town hall meetings should be launched to sensitize residents about the benefits of proper waste management, including health protection, flood prevention, and income opportunities from recycling. Incorporating environmental education into school curricula would also instill waste management consciousness in younger generations (Adeolu, Enesi, & Adeolu, 2014). Community-based organizations and youth groups can further be mobilized to organize clean-up exercises, monitor compliance, and champion behavior change within the township.

Development of Engineered Sanitary Landfills

The open dumpsites currently used in Lapai pose serious threats to groundwater, air quality, and food safety due to uncontrolled leachate and waste burning. A transition from open dumping to engineered sanitary landfills is therefore necessary. Sanitary landfills are designed with protective liners, leachate collection systems, and controlled waste layering, which minimize environmental risks. Even at a modest scale, a properly engineered landfill for Lapai would provide a safer alternative to unmanaged dumpsites and align with international best practices (World Bank, 2018). Local authorities, with support from Niger State government and development partners, should prioritize land acquisition and investment in landfill construction. Additionally, waste-to-energy options such as biogas plants from organic waste could be integrated into landfill operations, thereby addressing both waste management and energy needs in the community.

Policy Reforms and Community Participation

Policy and institutional reforms are fundamental to ensuring sustainable waste management in Lapai. The local government needs to strengthen enforcement of sanitation by-laws, with penalties for indiscriminate dumping and incentives for households and businesses that adopt proper waste practices. Partnerships with private sector operators through public-private partnerships (PPPs) should be encouraged to improve collection efficiency and recycling initiatives (Abila & Kantola, 2013). Importantly, community participation must be institutionalized by involving residents in decision-making about waste site locations, waste collection schedules, and monitoring of environmental impacts. Grassroots involvement fosters ownership and accountability, which are essential for the success of waste management programs.

11. 0 Conclusion

The study examined the environmental, health, and socio-economic impacts of unmanaged dumpsites in Lapai township, Niger State. Findings revealed that poor waste management practices, characterized by indiscriminate dumping, open burning, and inadequate disposal infrastructure, have led to severe soil, air, and water pollution. These practices not only compromise environmental quality but also expose residents to significant health risks such as respiratory infections, waterborne diseases, and heavy metal toxicity. Additionally, dumpsites lower property values, diminish agricultural productivity, and increase medical expenditure among residents. The persistence of policy gaps, weak enforcement, and limited public awareness further aggravates the waste management crisis. The research highlights the urgent need for sustainable interventions, including engineered sanitary landfills, waste segregation, recycling initiatives, and public education. Strengthening institutional frameworks, enforcing environmental regulations, and fostering community participation will be critical in mitigating the environmental and socio-economic burdens posed by dumpsites in Lapai. Such efforts will not only safeguard public health but also contribute to achieving sustainable development goals, particularly in the areas of clean environment, sustainable cities, and climate action.

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