

# The system Analyst View: Waste Management System (WMS) in Anambra State Capital City (Awka)

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## ABSTRACT

Waste Management in Anambra State Capital City (AWKA) has become a serious concern both to individuals and government. Smart-Trash also known as Waste Management System (WMS) is a comprehensive system designed to efficiently and effectively manage waste in the city. The system includes various components such as waste collection, transportation and disposal. In Awka, waste collection is carried out by designated waste management agencies or contractors. These agencies are responsible for collecting waste from households, commercial establishments, and public areas. They use specialized vehicles and equipment to ensure proper collection and containment of waste. Once the waste is collected, it is transported to designated landfill sites for outright disposal. Prototyping Methodology was adopted. In this paradigm, an Online Waste Management System (OWMS) called Smart-Trash software (application/app) is modeled to coordinate the process of proper solid waste disposal swiftly. The software connects the waste generators and the waste collectors, then eventual management of the waste. Anambra state (Awka in particular) will have treatment facilities, including composting plants, recycling centers, and waste-to-energy plants. These facilities employ advanced technologies to process waste and minimize its environmental impact. After treatment, the waste is either recycled or disposed of in a safe and environmentally friendly manner. The Recycling efforts will focus on materials such as paper, plastic, glass, and metal. These materials are sorted, processed, and sent to recycling industries for further use. For waste that cannot be recycled, proper disposal methods are employed. Non-recyclable waste is safely disposed of at designated landfill sites. These landfill sites are carefully managed to prevent environmental contamination and ensure long-term sustainability. Overall, the Waste Management System in Awka aims to promote a clean and healthy environment by efficiently managing waste and minimizing its impact on the city and its residents.

**Keywords:** Organic Waste, Inorganic waste, Waste generators, Waste Collectors

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## INTRODUCTION

Waste management is all about making sure that we take care of the garbage we create or generate in a safe and responsible way. When we throw away things like food scraps, papers, plastic bags, pieces of metal or empty containers, they go to a special place called a Landfill or are burst or recycled. According to [1] and [2], the volume of waste generated in any city is often a reflection of the intensity of human activities such as population growth, urbanization and social development, resources exploitation and unchecked technological advancement. Solid waste management is the most pressing environmental challenge faced by urban and rural areas of Nigeria and in Anamba state in particular. Anamba state, with over 9 million residents in the state. Awka been the capital has about 1million population. Ifite-Awka where Nnamdi Azikiwe University High school is, is one of the largest producers of solid waste in Awka, because of the concentration of students within this geographical space.

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Despite a host of policies and regulations, solid waste management in the country is assuming alarming proportions with each passing day, asserted by [3]; [4]; [5].

#### Identification of Problem

Reckless disposal of municipal solid waste has led to blockage of sewers and drainage networks and choking of water bodies. Most of the wastes is generated by households and in some cases, by hostels, artisans and traders which litters the immediate surroundings. Figure 1, illustrate the existing dumpsite disposal spaces around Ifite-awka. Improper disposal of municipal wastes is leading to an environmental catastrophe at the environment. Currently, there are no integrated or smart waste management system or organized waste management system. hence this work seeks to leverage on software technology deployment with special attention on waste collections, separation, commercialization important part, recycling then final disposal of non-degradable constitute of collected waste.



Figure 1: Existing dumpsite disposal spaces around Ifite-awka, Unizik.

The effect of this (see figure 1) solid waste from waste generators (Residence, hostels etc.) cannot be overemphasized. Various hazards are associated with the waste when or if indiscriminately disposed. e.g., surface water contamination, ground water contamination, bad smell or odour, release of greenhouse gases, accidental hazard caused by fire, slope instability, loss of vegetation, Soil contamination and bird-hit etc. The release of greenhouse gases is linked to climate change and global warming.

#### Methodology/Solution

Technically, a system analyst will design a model as a solution to problem. Prototyping Methodology was adopted, to reveal all the components of the Online Waste Management System (OWMS) a software (application/app) that coordinates the process of proper solid waste disposal. The solution comprises the policies (rules and regulations), people (owners of waste) and vehicles (transporters of waste). To keep our environment clean and healthy by properly handling all the garbage we generate. The Online Waste Management System. The components of this model are follows:

- a. Develop a guide or regulation for residential waste disposal
- b. Develop a waste dispose registration module
- c. Develop waste generator request module
- d. Develop waste disposal payment indication module
- e. Develop waste collector module
- f. Develop waste managers cum administrator's module

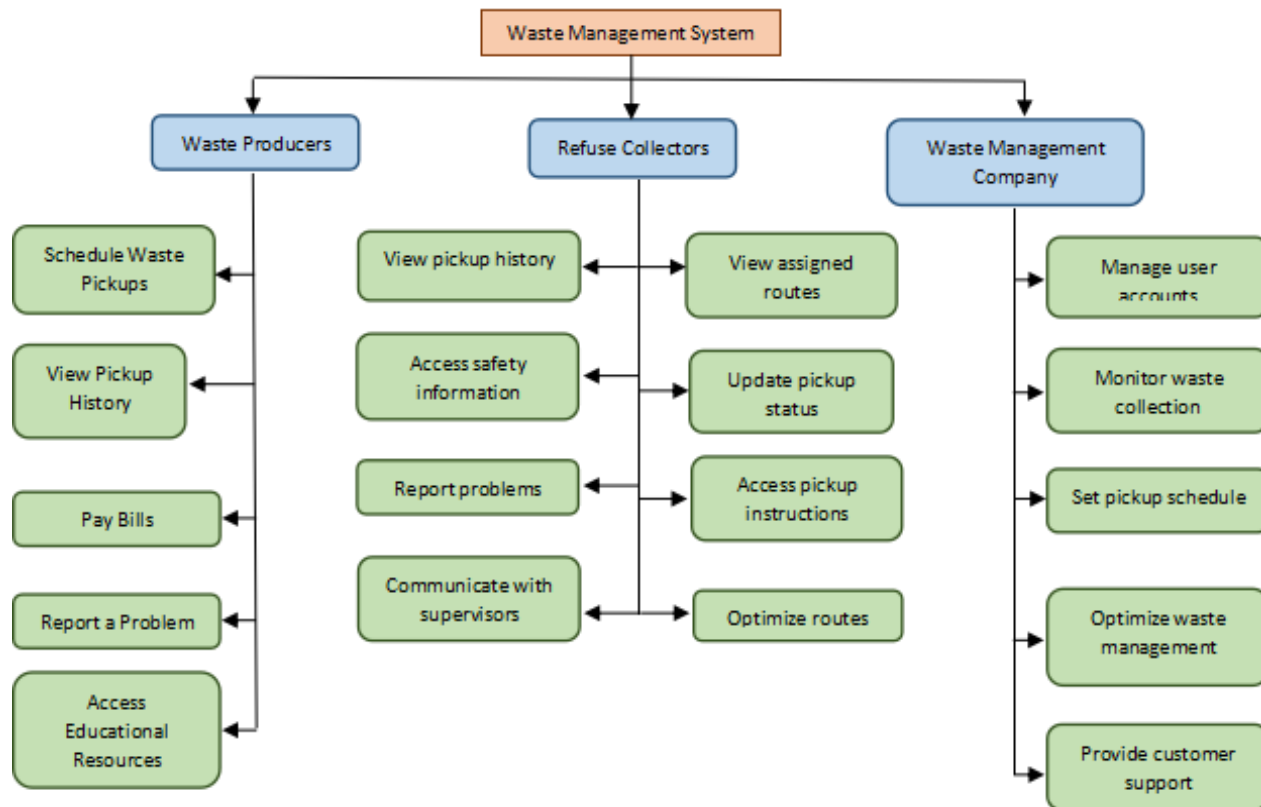


Figure 2: Waste Management Software Model

The block diagram in (Figure 2) illustrates the waste management system. it includes various components and processes involved in the management of waste. This diagram can vary depending on the specific system being depicted, but some common elements contained in Figure 3.0 include waste producers or generator, Refuse or waste collector, waste management company (who is saddled with the responsibility of transportation routes, waste treatment facilities, recycling centers, and disposal sites). The diagrams may also show the flow of waste from its generation to its final disposal, highlighting the different stages and activities involved in the waste management process.

**Management of the waste**

Anambra state (Awka, in particular) will have treatment facilities, including composting plants, recycling centers, and waste-to-energy plants. For effective treatment of waste, proper categorization must have done into Organic and Inorganic waste for adequate management. Center for Agriculture, Food, and the Environment, 2023: described Composting as a managed process which utilizes microorganisms naturally present in organic matter and soil to decompose organic material. These microorganisms require basic nutrients, oxygen, and water in order for decomposition to occur at an accelerated pace. The end-product, compost, is a dark brown, humus-like material which can be easily and safely handled, stored, and used as a valuable soil conditioner. The composting process is dependent upon several factors, including: the population of microorganisms, carbon to nitrogen ratio, oxygen level, temperature, moisture, surface area, pH, and time. The composting process involves microorganisms feeding on organic material and consuming oxygen. The process generates heat, drives off moisture, and reduces bulky organic waste into a beneficial soil-like material containing nutrients, humus and microorganisms in just a few months. Material in an unmanaged pile of organic debris will eventually break down but the process will take a long time and may result in odor or other nuisance problems due to poor aeration.

**Established waste treatment technologies**

**Incineration:** Incineration is a waste treatment process that involves the combustion of substances contained in waste materials. Industrial plants for waste incineration are commonly referred to as waste-to-energy facilities. Incineration and other high-temperature waste treatment systems are described as "thermal treatment". Incineration of waste materials converts the waste into ash, flue gas and heat. The ash is mostly formed by the inorganic constituents of the waste and may take the form of solid lumps or particulates carried by the flue gas. The

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flue gases must be cleaned of gaseous and particulate pollutants before they are dispersed into the atmosphere. In some cases, the heat that is generated by incineration can be used to generate electric power.

**Landfill:** A landfill site, also known as a tip, dump, rubbish dump, garbage dump, or dumping ground, is a site for the disposal of waste materials. Landfill is the oldest and most common form of waste disposal, although the systematic burial of the waste with daily, intermediate and final covers only began in the 1940s. In the past, refuse was simply left in piles or thrown into pits; in archeology this is known as a midden.

**Recycling:** Recycling is the process of converting waste materials into new materials and objects. This concept often includes the recovery of energy from waste materials. The recyclability of a material depends on its ability to reacquire the properties it had in its original state. It is an alternative to "conventional" waste disposal that can save material and help lower greenhouse gas emissions. It can also prevent the waste of potentially useful materials and reduce the consumption of fresh raw materials, reducing energy use, air pollution (from incineration) and water pollution (from landfilling). After treatment, the waste is either recycled or disposed of in a safe and environmentally friendly manner. The Recycling efforts focus on materials such as paper, plastic, glass, and metal. These materials are sorted, processed, and sent to recycling industries for further use. For waste that cannot be recycled, proper disposal methods are employed. Non-recyclable waste is safely disposed of at designated landfill sites. These landfill sites are carefully managed to prevent environmental contamination and ensure long-term sustainability.

#### Marketability and Profitability

The waste management system is designed to be promoted by a private waste management organization, that may partner with local or state government for compliance and excursion of penalties on defaulters. Apart from source of revenue to the private managers of the process, to the government a source of IGR.

To make this solution known to the population using all the media agencies of the government in the state like Anambra Broadcasting Service (ABS) TV/RADIO, Purity FM; social media adverts, community awareness and mean of marketing will be adopted. Besides revenue for stakeholders, this idea will solve a range of environmental, health, and social problems some of which include:

**Environmental pollution:** When waste is not managed properly, it can cause pollution of the air, water, and soil. This can harm plants, animals, and people, and can have long-term effects on the environment.

**Public health risks:** Improperly managed waste can also create health risks for people who are exposed to it, such as refuse collectors and local communities. This can lead to the spread of diseases and other health problems.

**Resource depletion:** When waste is not managed sustainably, it can lead to the depletion of natural resources, such as land, water, and energy. This can have long-term impacts on human well-being.

**Climate change:** The production and management of waste can also contribute to climate change by generating greenhouse gas emissions. These emissions can exacerbate global warming and its associated impacts such as sea level rise and extreme weather events.

A waste management system can help us to address these problems by providing a framework for the safe, efficient, and sustainable management of waste. By implementing a waste management system, we can help to protect the environment, promote public health, conserve natural resources, and mitigate climate change.

#### Target Audience/stakeholders

Stakeholders are people, groups, or organizations that have a "stake" or interest in the waste management system. This means they are affected by or benefited from the way waste is managed; they also have the power to influence how waste is managed.

In this system, the stakeholders include:

1. Waste generators or owners: These are people, offices, institutions, businesses or industries who produce waste and need it to be collected and disposed of properly.
2. Waste Collectors: These are the people or companies who collect the waste from refuse owners and transport it to disposal sites.
3. Waste Management companies: These are companies that provide a range of waste management services, such as collection, transportation, processing, and disposal.
4. Government Agencies: These are organizations that regulate waste management activities, enforce laws and regulations, and provide funding or support for waste management programs.
5. Local Communities: These are groups of people who live or work in the areas where waste is managed, and who are affected by the environment, health, and social impacts of waste management activities.

All these stakeholders have a role to play in the waste management system, and they all have their own interests and concerns. By working together, stakeholders can help to create a waste management system that is safe, effective, and sustainable for everyone involved.

Waste Management System (WMS)

The Waste Management System (WMS) when fully implemented will be called Smart-Trash (see prototype in Figures 3 , 4, 5) because its overall goal is to swiftly dispose waste and promote green environmental strategy currently advocated by the state government.

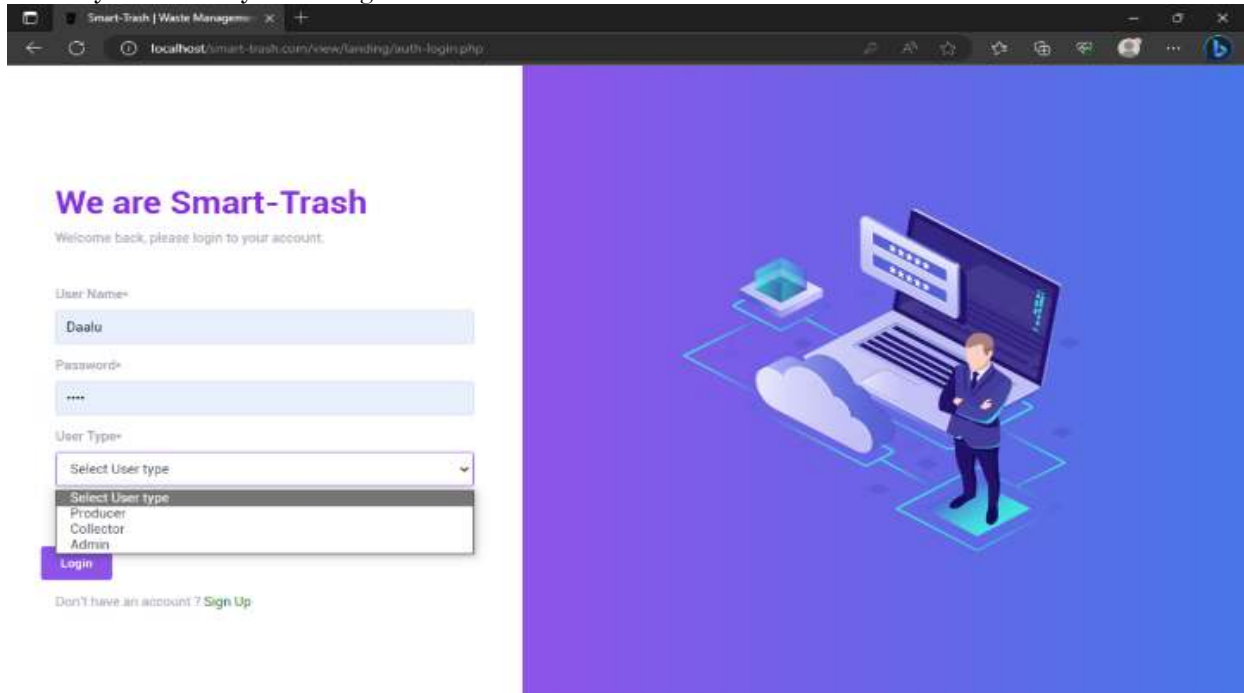


Figure 3: The waste generators registration page

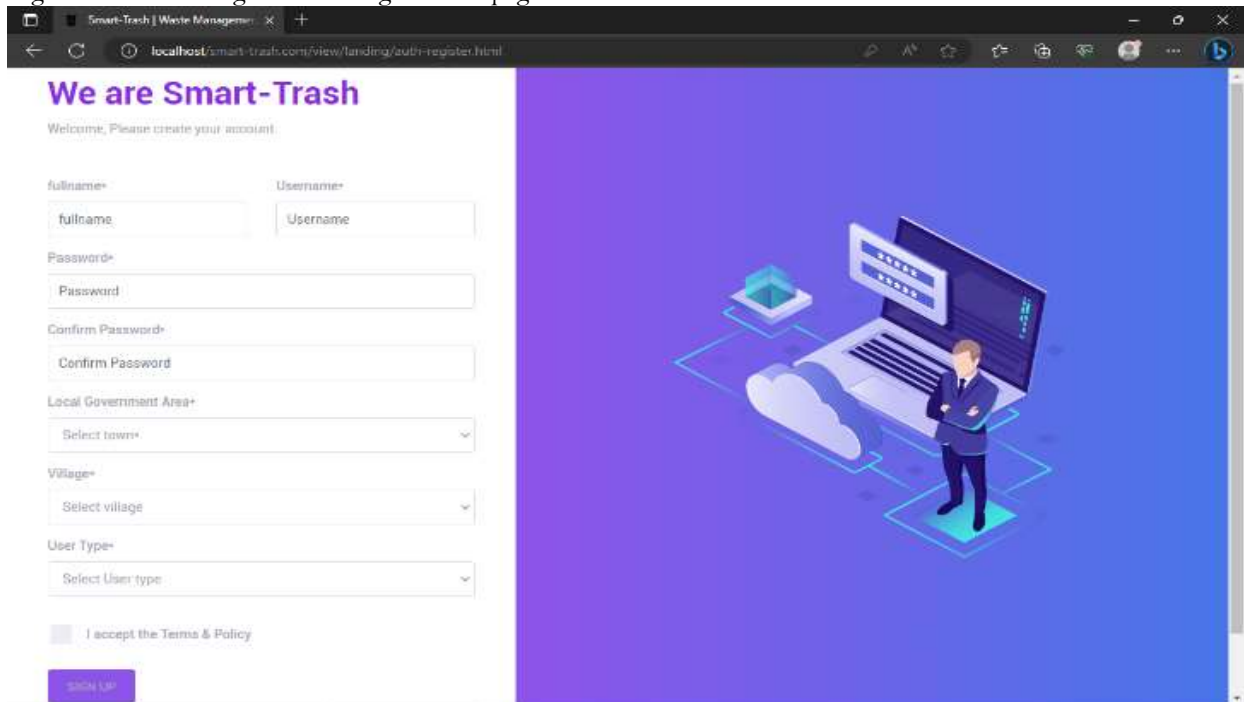


Figure 4: The waste collectors approval page

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Figure 5: The waste collectors transportation schedule page

### CONCLUSION AND RECOMMENDATIONS

Actually, it is quite essential for one to take note of the verity about management of waste and its implication to health and life ultimately. The careless act of waste management is one of the most environmental decays today in the state, which have blocked most of the water ways enhancing erosion. The advent of the current government and its policy on clearing the water ways is a commendable move, the sustainability is paramount. Now, findings indicate that most of the state budget is consumed by erosion menses hence, an organized and highly computerized strategy to waste management needed. The Government must address the fear of waste management policy implementation and check unbridled disposal of solid waste by law enforcement agencies, and integrate moral and societal value teachings into state-owned schools. In our tertiary institutions, academic and scientific driven research to enhance the recycling initiative and eventual industrialization. Public Private Partners (PPP) can be licensed to setup treatment plants, encouraging and supporting complete waste processing value chain. Finally, the proposed Waste Management System for Awka will promote a clean and healthy environment by efficiently managing waste and minimizing its impact on the city and its residents.

### RECOMMENDATIONS

The following recommendation should be taken into consideration:

- i. There should be an educative enlightenment campaign for segregation, collection and recycling of waste programmes, and support for scavengers in every community in Anambra state.
- ii. The generation of waste should be avoided where practicable and economically feasible.
- iii. Where practicable, waste reduction, waste recovery, reprocessing, reuse, and recycling should be encouraged.
- iv. Residents in municipal areas should be educated on the need to segregate waste to assist in recycling.
- iii. The open dumps in many cities should be upgraded to semi-landfills in order to prevent infiltration of leachate, erosion, and contamination of groundwater.
- iv. All-inclusive legal framework and enforcement of the state legislation concerning waste management.
- v. High investment in infrastructure and adequate human capacity for administrative and technical issues should be encouraged.
- vi. Re-Orientation of the public towards solid waste disposal and management.
- vii. Proper Planning analytics- High data management and controlled urbanization will aid a healthy environment.
- viii. Partnership with research institutions and industrial linkages with foreign agencies for interventions.

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