

# Wealth not Waste, Options for Developing a Smart City

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# Paper Outline

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- ▶ Waste Definitions and classifications
- ▶ Waste management
- ▶ Evolving Innovative tools for Waste Management
- ▶ Wealth Not Waste, What are the Options
- ▶ Source Segregation as a tool
- ▶ Waste Hierarchy as a tool
- ▶ Extended Producer Responsibility (EPR) as a tool
- ▶ Circular Economy as a tool
- ▶ Waste to Energy, Waste to Compost
- ▶ MRF and Material Recycling as tools
- ▶ Paradigm shift
- ▶ Benefits of evolving innovative tools for Waste Management
- ▶ Implementing SDGs
- ▶ Conclusions

# Introduction:

## Lagos

- One of the 36 states of Nigeria with 57 LGA/LCDAs
- Size – About 3577 Sq. Km (0.39% of Nigeria's 923,773 Sq. Km)
- Population of about 22 million people
- 2.5 Million household with 6% annual Growth rates
- Commercial hub of Nigeria & the West African sub-region



Map of Nigeria

# Introduction 2:

## Lagos

- In 2015 Lagos became the 3<sup>rd</sup> largest megacity in the world. Currently working on transforming into Smart City.
- PSP in waste management commenced in Lagos in the 80s
- Over 70% of the total industries in Nigeria are cited in Lagos
- Generate between 17 & 20,000 MT of waste daily
- The generation per capita (GPC) is put at 1.2kg/person/day (WB)
- A typical waste composition shows that over 50% is organic organic fractions



Welcome to Lagos



Map of Lagos state

# Waste Definitions and classifications

## ► What is waste?

- Waste generation is as old as human existence, it occurs as a result human activities in consumption and production.
- There are so many definitions of waste depending on who is defining it.
- Generally, wastes can be defined as substances or materials that are of **no further value or use** to its generator.
- It can also be said to be substances or materials thrown away or about to be thrown away by the owner or generator. - Out of sight and throw away culture.

# Waste Definitions and classifications

## ► What is waste?

- The Basel Convention (Global convention on the transboundary movement of hazardous wastes -1998) defined wastes as substances or objects that are disposed or are intended to be disposed or are required to be disposed of by the provisions of the National laws.
- To a recycler or an economist or an industrialist; Wastes is a raw material or resources in a wrong hand or wrong place.
- To a waste picker; waste is a hidden treasure yet to be discovered or waiting to be explored

# Waste classifications

## ► Waste Types

- Broadly speaking, there are 2 types of wastes namely; general wastes (Non-Hazardous waste and Hazardous wastes).
- **General wastes:** These are also known as non-hazardous wastes, they are usually harmless and do not pose an immediate threat to man and the environment. G.W includes household wastes, C&D wastes, commercial waste, garden waste etc. G.W may however become hazardous if not properly managed.
- This is because most wastes in developing countries, especially household wastes are disposed in a comingled manner (dry cell batteries, Insecticides cans, Asbestos etc)

# Waste classifications

- **Hazardous waste:** HzW can be defined as substances or materials that are injurious or harmful or dangerous (even in low concentrations) to human health, animals, plants and the environment.
- HzW can be in so many forms; it could be in solid, liquid, gaseous, effluent or powdery forms. Most time they are discharged by the industries as effluent, gaseous emission and solid waste. It could also be found in unsorted household waste, healthcare waste and from construction and demolition waste in form of asbestos.
- HzW could be explosive, flammable liquids, flammable solids, Poisonous-Acute, corrosive, toxic, & \_with Radioactive properties etc



# Waste classifications

- ▶ There are several classifications of wastes, however it is mostly classified by:
  - **Origin:** e.g Healthcare wastes, C&D wastes, MSW, Industrial wastes, agricultural wastes, nuclear waste etc.
  - **Form:** e.g Solid, liquid gaseous and powdery wastes.
  - **Properties:** e.g Toxic, explosives or volatile, carcinogenic, reactive, acidic and alkaline
  - **Legal Definitions:** These includes special, controlled, household and industrial waste etc where specific definitions or criteria are used.
  - For the purpose of **Conversion**, waste can be broadly classified into 3; **The Recyclables, The Compostable and The Combustibles**

# Waste management

- **Waste management** can be defined as all efforts of humans including storage, collection, transportation, recovery, processing and disposal of all substances or materials that are no longer needed by the original generator.
- The Oxford Advanced Dictionary defines Management as the act or skill of dealing with people or situations in a successful way. Equally, Wikipedia defines Management as the act of getting people to accomplish desired goal and objectives using available resources efficiently and effectively, it includes *Planning, Organizing, Staffing, Leading or Directing and controlling* an organization or system for the purpose of accomplishing a goal.

# Waste management

- It went further to describe **management** as a human action including designs to facilitate the production of a useful outcome for a system
- Therefore waste management can also be described as human actions including *Designs, Planning, Organizing, Staffing, Leading or Directing and controlling* an organization or system for the purpose of accomplishing a goals.
- The goals to be accomplished with waste management are;
  - ✓ To reduce the effects of waste on human health. (Public Health reasons)
  - ✓ To reduce the effects of waste on the Environment. (Prevent air, water and soil pollution) - Our existence...
  - ✓ To maintain and improve the aesthetics
  - ✓ And lastly, for resource recovery (Food, Raw-materials, Energy etc)

# Evolving innovative tools for Waste Mgt.

- Globally, waste management has moved from the traditional / basic waste Collection and Disposal.
- Innovative Technologies plays crucial role in modern waste management practices, this has made effective and sustainable waste management more seamless.

## KEY STEPS TO SUSTAINABLE WASTE MANAGEMENT

- Set your vision: Ensure that the vision is SMART - Specific, Measurable, Attainable, Realistic & Timely.
- Set the goals you want to accomplished
- Policy Development - Including Legal/Regulatory framework, Institutional Development, Funding source/ Plan, Socio-Political issues (SWOT Analysis should also be deployed).
- Adoption of tools
- Policy Implementation & Monitoring
- Evaluation & Feedback
- Political WILL is key

# Wealth Not Waste, What are the Options?

- Waste indeed is not a waste, unless you waste it.
- Innovations within the waste management industry is based on technological & Scientific advancement which leads to the development of various tools/methodologies that has enhanced effective, efficient and sustainable waste management.
- The next slides will highlights various options that has been effective globally in buttressing the fact that Waste is a resource and Wealth yet to be tapped.

# Source Segregation as a Tool

- Waste segregation is one of the simplest strategies of implementing waste to wealth.
- Source segregation of waste is the process of separating the generated waste into different component at the point of generation.
- The separation could be as simple as sorting into dry and wet waste, it could also be as complex as sorting into as many as 6 to 8 or more components
- It encourages Recycling & Recovery
- It could be a source of income
- It provides clean & uncontaminated waste materials to the Recyclers
- It reduces the volume of waste disposed at the disposal sites



# Waste Hierarchy as a Tool

Waste hierarchy is one of the widely adopted WM concept

It is supported and promoted by the UN, through the popular 3Rs (Reduce, Reuse and Recycle).

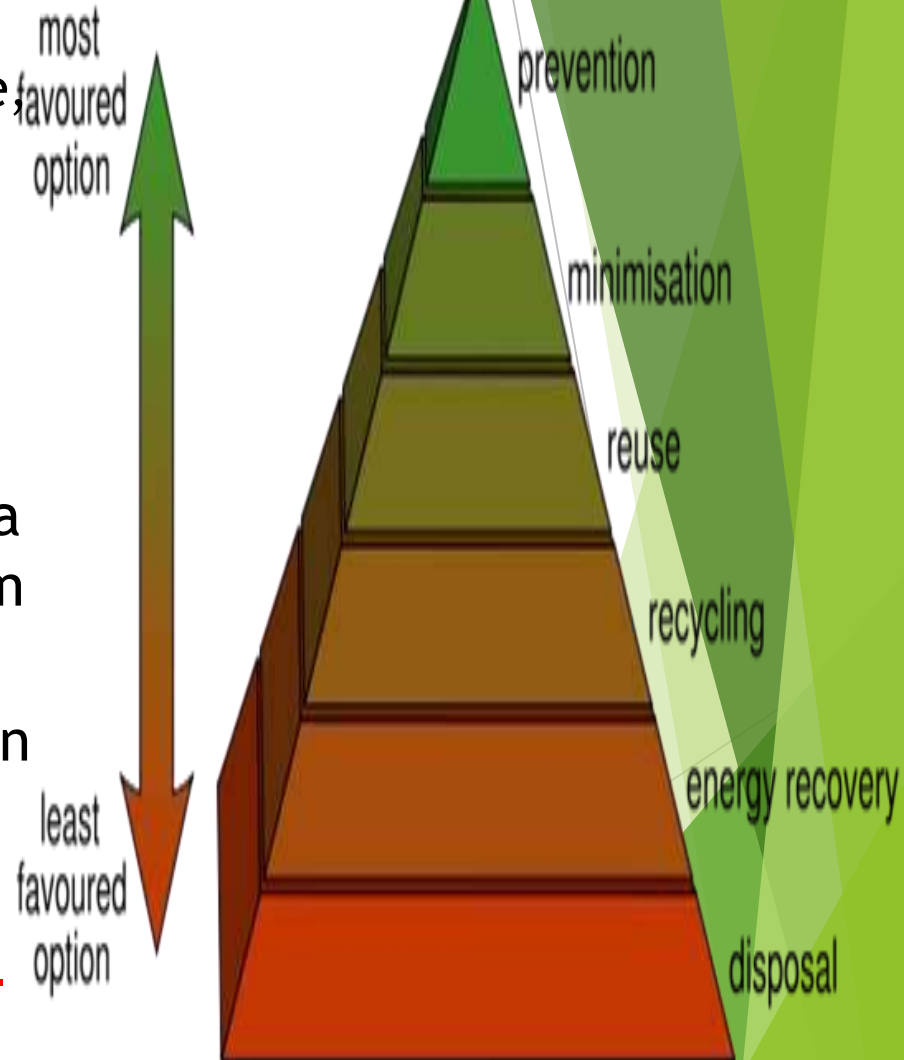
The concept classify WM strategies according its ability to promote or encourage Zero Waste.

The concept is hinged on the extraction of maximum usage of a product and to generate minimum waste.

There are some new arguments on the hierarchy.

Another widely adopted WM concept is **Polluter Pays Principle**.

It also encourage resource recovery



# Extended Producer Responsibility (EPR)

## ► What is EPR?

- It is a strategy designed to promote the integration of environmental costs (PPP) associated with goods throughout their life cycles into the market price of the products. (Thomas Lindhqvist , April 1992)
- It is therefore an environmental protection strategy to reach an environmental objective of a decreased total environmental impact of a product, by making the manufacturer of the product responsible for the entire life-cycle of the product and especially for the **take-back, recycling, treatment** and **final disposal**.
- The concept was first introduced in Sweden in the 1990s by L, T in conjunction with Swedish Ministry of environment.
- In Nigeria EPR is promoted by NESREA, unfortunately the implementation is a bit challenging



# The Goals/Benefits of EPR?

- ▶ The goals and benefits of EPR programs are numerous; below are just few:
  - It encourages producers to redesign their products (at source) for effective usage and recycling.
  - It helps to “avoid everyone’s responsibility is no one’s responsibility” - Someone must be responsible.
  - It ensures the recovery and recycling of waste in the most economically efficient and Environmentally Sound Manner (ESM)
  - It supplements PPP & waste hierarchy through higher utilization of products & materials (3Rs)
  - Effective collection system.

# Circular Economy as a Tool

- Circular Economy is another strategy of implementing total waste utilization.
- It is aimed at maximizing waste usage for a more competitive resource efficiency economy.
- C.E simply means reusing, repairing, refurbishing, recycling and energy recovery of existing materials & products, Usually called “Waste” (Not Take , Make & Dispose)
- It helps in the conservation of the natural resources.
- It encourages Recycling & Recovery
- It provides clean & uncontaminated waste materials to the Recyclers
- It reduces the volume of waste disposed at the disposal sites



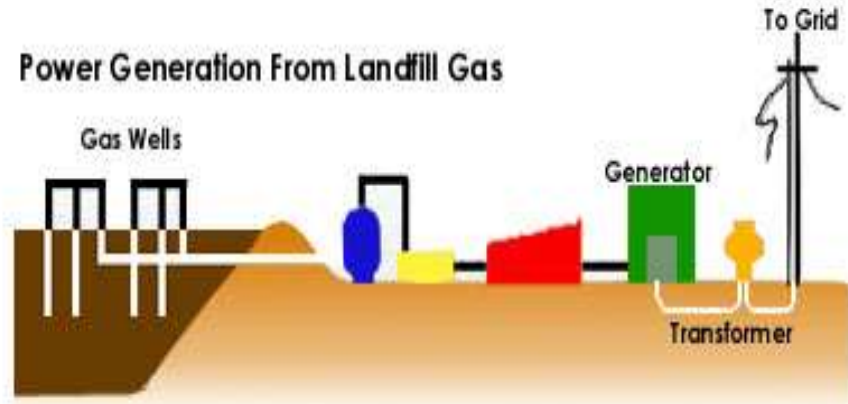
# Waste to Energy as a Tool

- Waste-to-energy or energy-from-waste is the process of generating energy in the form of electricity and/or heat from the primary treatment of waste, or the processing of waste into a fuel source. WtE is a form of energy recovery. (Wikipedia)
- It helps in reducing the emission of carbon Dioxide & Methane and replace fossil fuels usage.
- There are different technological processes of converting WtE, these include;
  - ✓ Gasification: It's a process of converting waste materials rich in carbon (High calorific value) through exposure to very high Temp ( $>700\text{ }^{\circ}\text{C}$ ), without combustion, with a controlled amount of oxygen and/or steam.



# WtE as a Tool...Cont.

- ✓ Pyrolysis: This is the process of thermal degradation of the waste in the total absence of air that produces other products like combustible gases, char/carbon, oil/wax
- ✓ Landfill Gas Recovery: Gas wells/Vents
- ✓ Anaerobic digestion - Breakdown of organic matters without Oxygen
- ✓ Incineration: It is a waste treatment process that involves the combustion of organic substances contained in waste materials. 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



NB: There is growing global concerns about the operations of Incinerators

# Waste to Compost as a Tool

- Composting is a controlled decomposition of raw organic raw materials into biologically stable humid substances called Compost or Organic Fertilizer.
- There are different types of composting processes, ranging from the simplest to advance technologies which includes;
  - ✓ Backyard Composting:
  - ✓ Windrow system
  - ✓ Passive Aerated Windrow
  - ✓ Forced Aerated Windrow
  - ✓ Vermiculture or Vermi-Composting: This is the usage of worms or micro-organisms to process organic waste in a controlled manner to produce rich valuable soil conditioner called Vermi Compost or Worm compost



# Material Recovery Facilities (MRFs) as a Tool

- An MRF is a facility or plant that received unsorted waste materials and then sort the waste (either manually or through Automation) into different waste components for internal recycling & conversion or for the purpose of selling the sorted waste to end users.
- Depending on the country, most MRFs sort out the waste into 3 major component, namely;
  - ✓ The Recyclables, which is further sorted out into Metals, Aluminum, Plastics, Paper, Glass, etc
  - ✓ The Combustibles, also called Refuse Derived Fuel (RDF)
  - ✓ The Compostables, also called organic matters/wastes
- ✓ NB: No to Transfer Loading Stations (TLSs)



# Material Recycling as a Tool

- Recycling is the conversion of waste materials into new raw materials or materials for both industrial and human consumption.
- Recycling technology could be simple or complex in nature;
- Several Recyclables materials like Metals, Aluminum, Plastics, Paper, Glass, Bones, Wood, E-waste, Cow dung etc can be converted into other useful products/materials



# Wealth Not Waste

- ▶ The numerous modern components of waste management has demonstrated that our waste is not real a waste, but a resource and source of Wealth;
- By 2020, global recycling will worth about 35 Billion Euros
- Biogas market globally is put at over USD 217Bn
- The Global scrap metal market will worth USD 406.16Bn by 2020
- The Global E-waste market will worth USD 11Bn by 2024



# Wealth Not Waste, Implementing SDGs

- ▶ It is pertinent to state that waste recovery, recycling & treatment activities are all sources of employment, job creation, wealth creation & distribution, foreign exchange earnings, poverty alleviation & reduction and environmental sustenance through reduction in the volume of waste to be landfill. Inline with United Nation's Sustainable Development Goals (SDGs).
- ▶ Implementing Goals 1(No Poverty), 2(Zero Hunger), 3(Good Health & Wellbeing), 6(Clean water & Sanitation), 7(Affordable & Clean Energy), 8(Decent work & Economic Growth), 9(Industry Innovation & Infrastructure), 11(Sustainable cities & Communities), 12(Responsible Consumption & Production), 14(Life Below Water- Avoid plastics), 15(Life on Land - plant trees & Protect the Environment)

# Non- biodegradable Packaging materials



# Non- biodegradable Packaging materials



Do you know?



=



28 PET bottles = 1 T-shirt

Do you know?



=



670 Aluminum cans = 1 Bicycle

Do you know?



=



19,000 tins (steel) = 1 small car

# Paradigm Shift

- ▶ The time for paradigm shift from the old way of seeing waste as a ‘throw away materials’ is NOW!
- ▶ Nigerian manufacturers (importers/ distributors) need to embrace the EPR strategy to ensure effective take-back, recycling , treatment and safe disposal of all end of life products manufactured by them.
- ▶ Manufacturers should begin to Think out of the box, in terms of products re-design, resource efficiency and the management of their waste packaging materials in the most economically efficient and environmentally sound manner.
- ▶ It is time to begin to see **cash** in our **trash**.
- ▶ Take note ‘waste is not waste unless you waste it’

# Paradigm Shift

- ▶ The manufacturers should begin to invest in technologies and equipment that will convert their waste into energy - Needed in their productions.
- ▶ The manufacturers should begin to fund effective collection of their packaging materials and end-of-life products for effective treatment and recycling.
- ▶ It is time for the establishment of recycling and treatment facilities in Nigeria to utilize the waste from the industrial sector and residential homes.
- ▶ It may be possible for manufacturers to earn some income from Carbon Credits for reducing the volume of Carbon released into the atmosphere. ?



# Recycling in other climes





# Recycling in the pipeline



# Recycling in the home



# Benefits of Recycling

- ▶ The benefits of recycling non-biodegradable and other biodegradable waste products cannot be overemphasized. It encourages the adoption of both PPP and resource efficiency thereby ensuring fullest utilization of products. The benefits includes, economic benefits, environmental benefits, social benefits and health benefits.
- ▶ Non-biodegradable as the name implies or suggested cannot be land filled or burnt like other wastes without some attendants problems

# Benefits...

## ► Economic benefits:

- Job creation, both direct and indirect jobs.
- It creates new line of Green businesses, such as transportation, resource recovery, processing and selling of recovered materials.
- Reduces the cost of production, through energy conservation, e.g aluminum production
- Reduces the cost of waste disposal
- Increased tax income for the government.
- Foreign exchange earnings

# Benefits...

## ► Environmental benefits:

- Reduced pollution of the air, water and land/soil.
- Saves or reduce the exploration of the natural resources.
- It helps to prolong the life span of disposal sites.
- Reduces deforestation.
- Reduces the generation of Green Houses Gasses which are released to the atmosphere when wastes are burnt, thereby causing climate change and global warming.
- Recycling brings about green economies

# Benefits...

## ► Health benefits:

- When plastics which is non-biodegradable in nature is burnt, it releases dangerous gasses like dioxins and furans that causes a lot of ill health like cancer, spontaneous abortion, lungs problems and several other diseases.
- Equally, when tyres are burnt, they also release several dangerous gasses too.
- Therefore when plastics are recycled, it saves us from some of these ill-health.
- Leachate from uncontrolled dumpsites are found to have polluted the underground water table thereby causing a lot of ill health.



# Conclusions 1...

- ▶ Using Lagos as a guide, it is pertinent to emphasise that **Political WILL** is key to a sustainable, effective & efficient integrated waste management system in developing a Smart City. In order to return Lagos state back to the path of Honour when her PSP model was a benchmark for other states in Nigeria and Africa, I will also like to recommend the following:
  - Set Vision that is SMART (Specific, Measurable, Attainable, Realistic & Timely)
  - Set Goals that are SMART too
  - In developing a WM model, every identified stakeholder must be carried along - Town hall meetings, Sustained Public Enlightenment & Education, NGOs
  - Creation of enabling environment through legislation & institutional frameworks. (Stick & Carrot Approach)
  - Policy Implementation, Monitoring and Feedback must be taken seriously
  - Increase budgetary allocation on WM
  - Develop local technology for WM (Think Globally - Act Locally) - My Cairo experience
  - Adequate agreements and guarantees **MUST** be given to the Private Sector to ensure sustained funding of WM Strategies/Models

# Conclusions 2...

- ▶ The government should ensure sustainable waste management system, including Waste Avoidance, waste storage, Door to Door collection, transportation, recovery, recycling, composting and Waste to Energy activities.
- ▶ Both government and all identified stakeholders should prioritize capacity development, through training and re-training of staff, study tours and exposures etc.
- ▶ Bridge the GAP between the Town and the Gown
- ▶ The time for paradigm shift from the old way of seeing waste as a 'throw away materials' is NOW!
- ▶ Nigerian manufacturers need to embrace the EPR strategy to ensure effective take-back, recycling and safe disposal of all end of life products manufactured by them.
- ▶ Manufacturers should be socially responsibility (CSR)
- ▶ Advocacies aimed at institutionalizing sustainable recycling activities should be embarked upon by Government and all other identified stakeholders.

# Ponder on this!!!

I will like to leave you with these parting words -  
Ponder on them!

“The Environment is our commonwealth and heritage, let us all preserve it by living right” - Adebola Olugbenga

“It is whatever you give to the Environment, that the Environment gives back to you” - Adebola O.

“Our lives begin to end the day we become silent about things that matters” - Dr. Martin Luther King Jr.

“The time is always ripe to do what is right” - Dr. Martin Luther King Jr.



**Thanks for your attention!**

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