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Case Study: Plans to Introduce Waste to Power In Nigeria

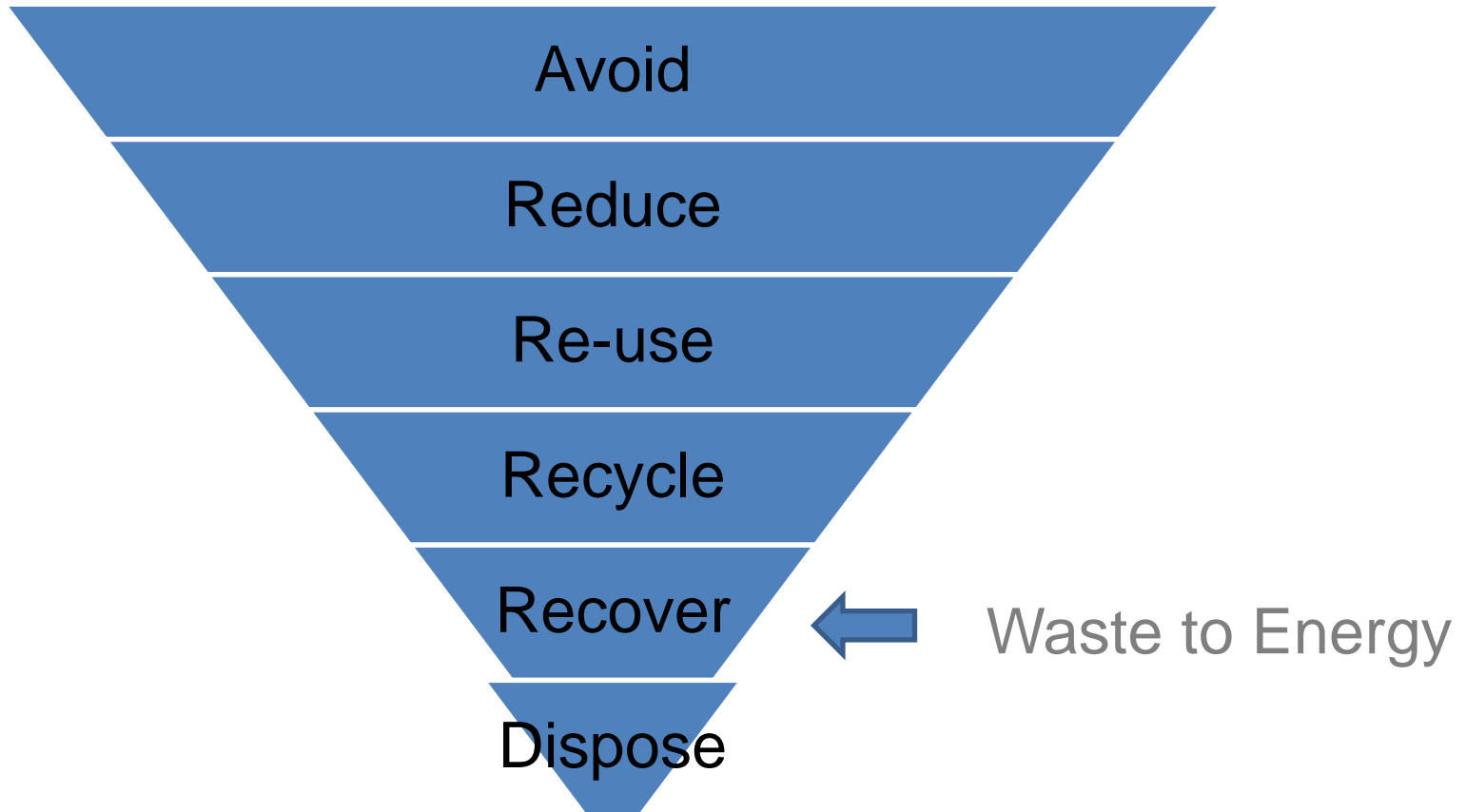
Introduction

- Chanja Datti, is a recycling company based out of Abuja
- Mainly focused on Collection of waste, with an eye towards Waste-To-Energy.
- Exploring possible pathways to enhancing energy sustainability in Nigeria; seeking partnerships that will promote WTE technology in Northern Nigeria.
- Most developed countries rarely rely on a single source of energy generation for her energy needs.

Waste-To-Energy Definition

- Waste-To-Energy (WTE) or Energy-From-Waste (EFW) is the process of generating energy in the form of electricity and/or heat from the primary treatment of waste.
- WTE is a form of energy recovery. Most WTE processes produce electricity and/or heat directly through combustion, or produce a combustible fuel commodity, such as methane, methanol, ethanol or synthetic fuels.

Waste Hierarchy



- Waste-To-Energy sits almost at the bottom of the waste hierarchy.

Municipal Solid Waste

- Municipal Solid waste (MSW) comprises of combined domestic, commercial and industrial waste generated in a given municipality or locality.
- Solid waste management in Nigeria is characterized by inefficient collection methods, insufficient coverage of the collection system and improper disposal of solid waste.
- Most cities and towns are characterized by waste disposal dumpsites situated on any available free land roads streets, drainages etc.

Environmental Issue

- Solid waste management (SWM) is the most pressing environmental challenge of Nigeria.
- Nigeria with population exceeding **170 Million** is one of the largest producers of solid waste in Africa.
- Nigeria generates around **542.5 million tons** of organic waste annually, with average daily rate of 0.44-0.66 kg per person.
- Only **10-20%** is collected, and ends up in dumpsites untreated.
- Improper collection and disposal of waste is leading to environmental catastrophe

Electricity Issue

- Peak power generation in Nigeria is below 4GW
- This caters for a population of over 170 million, which has resulted in an acute and interrupted power supply.
- As of 2014, The Nigerian Electricity Regulatory Commission (NERC) reported that about 81% of Nigerians generate their own electricity through the use of petrol and diesel powered generators to compensate for the irregular power supply.
- The same number of people spent a staggering N796.4 billion (approximately \$5 billion) to fuel them annually.

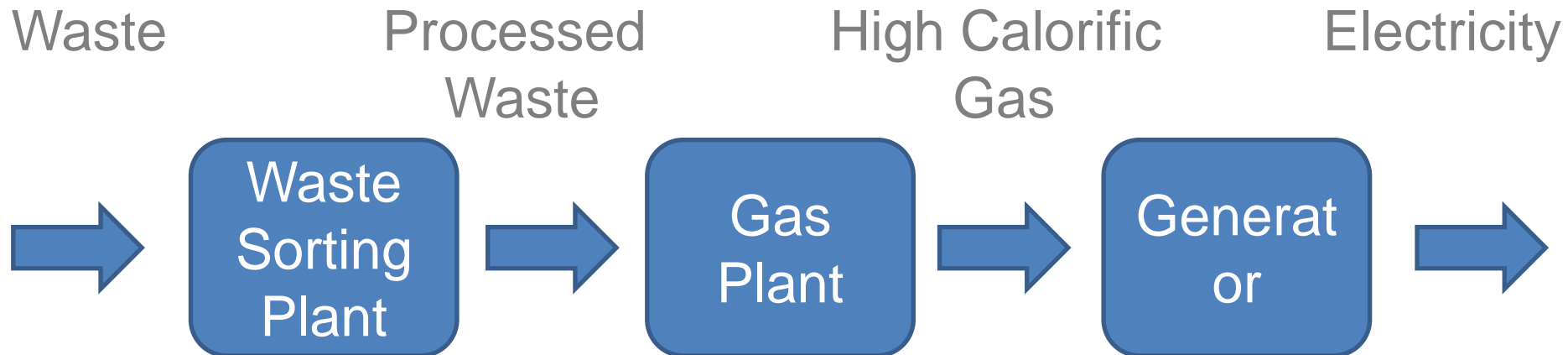
Population Growth

- With the current growing population (2.8% yearly rate); urbanization (4.66% yearly rate) and economic development (6.3% yearly GDP rate), the generation rate of SWM will double by 2030.
- Major ingredients of waste include organic (31-76%), paper (7-17%), plastic (4-18%), textiles (1-7%), metal (3-9%), glass (1-9%), others (9-22%) etc. depending on the population density and urban activities of the area.

Current Waste Situation

- Crude, primitive and reckless disposal of SWM especially open dumping has led to blockage of sewers and drainage networks, and choking water bodies.
- Problems of leachate, waste sludge and methane and odor emissions are occurring in dumpsites and its surrounding areas due to mostly non-sanitary or un-engineered dumpsites.
- Most of the waste is generated by households, local industries, artisans and traders which litters the immediate surroundings.

Waste-To-Energy Technology



Waste that has been delivered by trucks will be sorted, automatically as well as manually, as some types of waste may require pre-treatment.

In the gas plant, the waste is heated, but not necessarily burnt, and converted into a high-calorific gas. Here, oxygen may be added

The gas is buffered in tanks to ensure all-time availability, and can be delivered to the gas turbine as needed.

Potential for Waste-To-Energy in Nigeria

- Possibilities of converting SWM to Renewable energy is abundant.
- Choice of conversion technology depends on: type & quantity of waste, capital and operational cost, labor skill requirements, geographical location and infrastructure.
- Several WTE technologies include pyrolysis, anaerobic digestion (AD), transesterification, fermentation, gasification, incineration etc.
- Inroads in WTE provides the cost effective and eco-friendly solutions to both energy demand and SWM disposal problems.

Potential Estimates

- In 2013, per conservative estimates, 542.5 million tons of waste will generate about 25.56 billion m³ of methane/ biogas.
- This will in turn generate about 169,541.66 MWh and 88.19 million tons of bio-fertilizer.
- Estimated revenue generation of about N4.54 Trillion (\$29.29 billion) from both ventures.
- Huge opportunity to include WTE in the Energy mix.

Factors affecting feasibility of WTE adoption in Nigeria

- Lack of advanced technology
- Lack of knowledge of the composition of specific landfills
- Issue of funding, high cost of initial investment and long payback time
- Strength of solid waste management policy
- Lack of proper enforcement and environmental education
- Low awareness and technical know how
- Lack of manpower

Example in Lagos: Olusosun Landfill Gas

- Commercial hub of Nigeria, 2nd fastest growing city in Africa and 7th in the world
- Estimate population 21+ million
- Per capita waste generation of 0.5kg per day, the city generates more than 10,000 tons of urban waste daily
- Despite being model for other States in the Country, still a big challenge for LAWMA
- Example of WTE Project: Olusosun Landfill Gas Capturing facility

Example in Oyo: Cows to Kilowatts

- Nigeria produces ~ 227,500 tons of fresh animal waste daily.
- Since 1kg of fresh animal waste produces about 0.03m³ of biogas.
- Potentially produce ~6.8 million m³ of biogas every day from animal waste only.
- Example of WTE Project: Global Network for Environment and Economic Development Research (GNEEDER)/Cows to Kilowatts, Ibadan

Way Forward

- The legislative shifts of the past decade have seen major moves towards the implementation of advanced technology and innovative recycling solutions.
- Global waste to energy market growing and will continue to do so for at least 15 years.
- Large-scale investment is required to construct environmentally friendly facilities.
- Profitability of the electricity/heat generated from such plants is driving the attractiveness of investment and favoring partnerships with utility companies.

Areas of Partnership

- Provision and rehabilitation of sewage/drainage infrastructure, procurement of requisite equipment for collection & disposal of waste, monitoring, enforcement, training and manpower disposal;
- Support for public sector participation/involvement, waste management, with all levels of government, as well as NGOs, CBOs, CDAs and multi donor agencies;
- Technical support to establish framework for appropriate public enlightenment, implementation and enforcement of environmental laws and regulations.

Incentives for Investing

- Companies Income Tax
- Tax Relief for Research and Development
- Capital Allowances
- In plant training
- Investment in Infrastructure
- Investment in Economically Disadvantaged Areas
- Labor Intensive Mode of Production
- Local Value Added
- Re-Investment Allowance

Benefits of Waste-To-Energy Facilities

- Monies spent on WTE facilities remain within the communities, while 90 percent of the monies spent on landfills will be transferred out of the local economy.
- WTE facility generates revenue through the sale of electricity, tipping fees, and profits from the sale of recovered metals and facility construction generates high-paying jobs that cannot be outsourced.
- WTE facilities generate significant amounts of baseload renewable energy which can be sold to the national power grid.

Conclusion

- Waste management issues in Nigeria are not only related to land, but water, air and marine resources.
- A sustainable Integrated solid waste management is still at its infancy.
- Current SWM activities in Nigeria require a substantial and integrated approach with implementation of waste segregation at source, waste recycling, WTE and value-added product (VAP) recovery.
- By 2030, Nigeria government is aiming to generate about 10% of its energy requirements for renewable sources such as Solar, Wind & WTE systems

Thank You!